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ABSTRACT

This document contains selected conference papers all relating to visual literacy. The topics include: process issues in visual literacy; interpreting visual statements; what teachers need to know; multimedia presentations; distance education materials for correctional use; visual culture; audio-visual interaction in desktop multimedia; the evolution of a drawing; visualizing the experience of Alzheimer's; virtual reality and artificial intelligence; curriculum; successful student presentations; children's observations about art; gender equity and visual literacy; visualizing qualitative data; design expression; role of color in remembering graphically presented information; associations from pictures; selecting instructional visuals; photorealistic rendering; graphics and instructional design; effect of color coding and test type; symbols in international business; screen design; needs assessment; reader-response analysis; syntax of moving images; dual coding hypothesis; visuals for information access; visual dialect; visual communication media criticism; spatial representation; gender stereotyped computer clip-art images; scientific and technological imagery; electronic visualization; assessing attitudes toward computer technology; resources on the Internet; hypermedia and rural areas; visual design through hypermedia; visual cues; digitizing images for curriculum; photography/digital imaging; artistic performance and visual proficiency; and timeless images. Also, there is an author index and a list of author addresses. (DGM)

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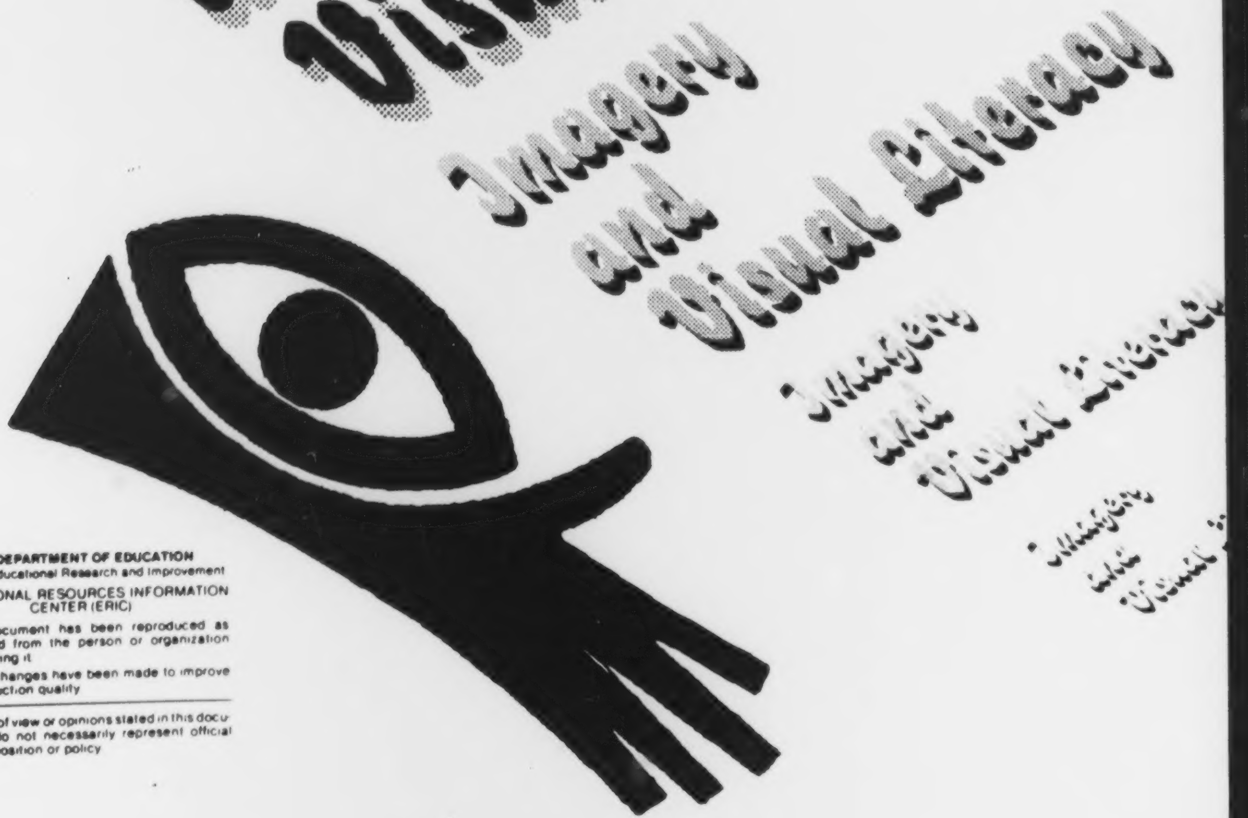
Imagery and Visual Literacy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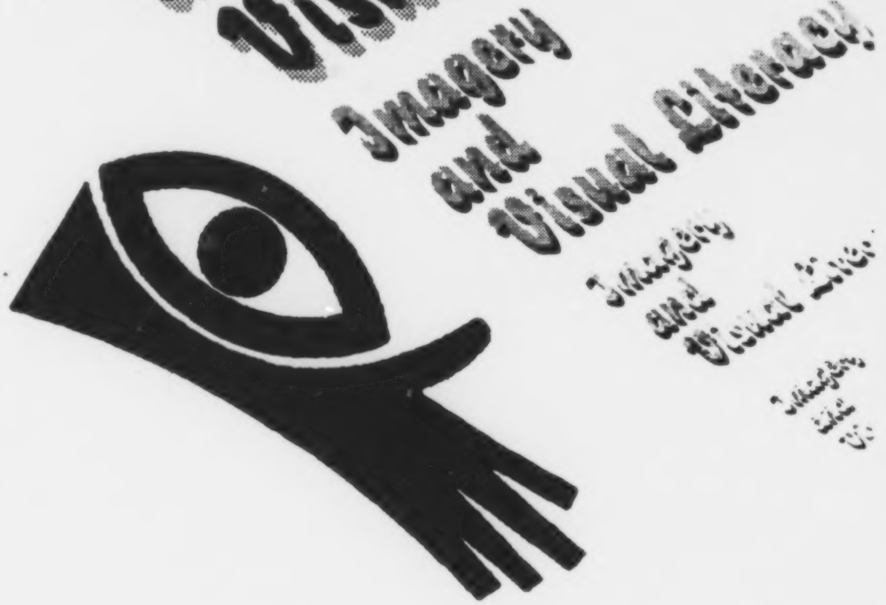
Imagery and Visual Literacy


Imagery
and
Visual Literacy

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"Words are but empty thanks..."
Cibber, 1697.

There are many to thank, and so little space and time in which to thank them. Why should we even try? Besides, they know who they are. They do what they do because they have helpful natures. They don't do these things because they have to, they do them because they want to (most of the time). They don't do them because they want to be thanked. They do them because they are just normally helpful people.

Some of the people we would thank (**like the authors themselves**) do this work because they want to add to the literature and this publication gives them an excellent opportunity to be published. Without them, however, this publication would not have been possible. If we were thanking people we would mention their willingness to meet deadlines and craft well written papers. Granted, some were easier to deal with than others, and for them we would be especially thankful. Some of the people we would thank (like **Navarro College's Eileen Kato, Linda Blatchley, Dana Brewer, Gena Hawkins and Kathy Suri**) are just plain helpful folks who work hard and pitch in when asked. If we were thanking them we would mention the long hours at the computers and phones, the constant attention to detail and their cheerful natures.

Others do this work for the betterment of the organization (like **Jeremy Rowe, Ed Oetting and the wonderful people at Arizona State University who put on the Tempe conference**). If we were thanking them we would mention their great conference, the fine presentations which lead to this book and their hard work and dedication to success.

And finally, one group did so much by holding things together while we put this book together (no proper amount of thanks is available to the **Beauchamp Family, the Griffin Family, and the Braden Family for their love, support, care, and generosity during this task**). A special word of thanks would go to **Dr. Beverly Braden** for her fine editing skills. Without her, we would not have been successful. For her hard work and dedication we, once again, designate her as an Associate Editor.

Every work, whether done alone or in a group, is a work of many. This book is no different. Without the help of others this book would not have been possible. We know they didn't do it because they wanted to be thanked, so we're not going to thank them. We just thought you'd like to know who they are, and how much we appreciate what they do.

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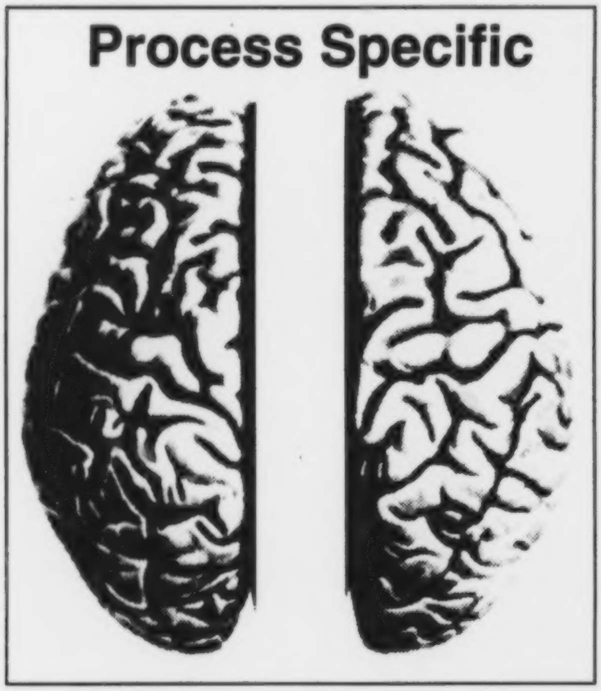
Process Issues in Visual Literacy

Dennis M. Dake

Often there is too little that is visual about visual literacy. The literature in visual literacy is scarcely more visual in its presentation than that in other professions. The printed materials dealing with visual literacy can most often be characterized as verbally driven analysis rather than being visually literate statements. This reductionist, analytic focus in visual literacy often confines itself merely to the lower order issues of instructional efficiency and to the selection of appropriate examples for visual illustration. Nearly missing from the professional literature on visual literacy is critical inquiry into encompassing visions of perception's unique contributions to higher order human thought and activity. Because of this oversight the visual literacy movement has failed to grow significantly in the twenty six years since its founding.



It is the contention of this paper that the essence of understanding visual literacy lies in the visually literate exploration of issues of process. This understanding must deal with both the processes involved in the creation and the interpretation of concrete images of visual communication. Visual discourse's greatest contribution to human knowledge and thought is not the sequential, linear, analytical text but the encompassing and holistic visual image. The former is rule driven and literally based while the latter is ambiguous, holistically rich, synthetic, and metaphoric in meaning.

Process Specific View of Brain Hemispheres

In seeking a foundational base for understanding process issues in visual literacy, I found that an in-depth review of the scientific literature related to the psychology of hemispheric specialization and laterality lead to some revealing possibilities. Specifically, in 1975 Dr. Joseph Bogen, in an article entitled, "Educational Aspects of Hemispheric Specialization," advanced the notion that the hemispheres of the human brain are best characterized as neither modality specific or material specific but rather as process specific.

In chart #1, I have outlined some of Dr. Bogen's suggestions concerning the specific mental processes that he feels best characterize the dominant functions of the left and right hemispheres in most humans. Reading down the left hand column seems to describe the process base for current visual literacy scholarship and inquiry. It is the right hand column, however, that suggests the specific processes most integral to the actual functions of visual literacy. The non-verbal, gestalt based apprehension and transformation of spatial configurations is the very essence of both visual thinking and graphic ideation. The sensitive apprehension and simultaneous, multiple processing of associations with these same visual configurations seems to provide the basis for the sound visually literate interpretation of images.

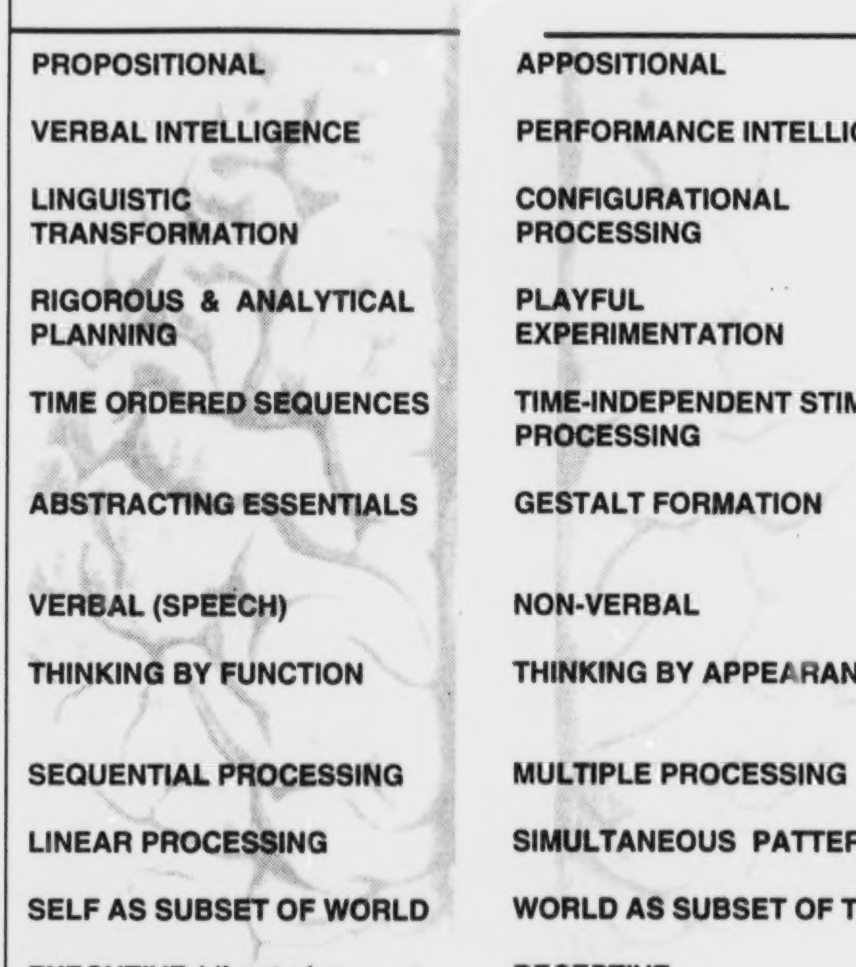
If the establishment of visual literacy, as a sound educational discipline, is the goal, scholars and researchers should concentrate on visual communication's original and unique roots in these right hemispherically disciplined processes. These processes are the unique endowment which visual language can provide to the educational process.

By concentrating on this process base, visual literacy can support its claim to being basic and foundational to the educational process. Visual Literacy should not allow itself to become " a scholastized, post-Gutenberg-industrialized, computer-happy exaggeration of the Graeco-Roman penchant for propositionizing," as Dr. Bogen characterized much of dominant western culture. By stressing its unique features, visual literacy can provide a valuable balancing function for education.

Process Specific Characteristics of Visual Literacy

Projecting from the scientific evidence, it seems that a great deal of visual literacy application, while clearly about visual literacy, is not at the same time exemplary of visual literacy. A balancing emphasis, using the specific processes that are unique to visual literacy, will provide the substantive content for effecting change in our culture. If the processes of visual ideation and the

Chart # 1: Process Specific Characteristics of the Hemispheres of the Brain



LEFT	RIGHT
PROPOSITIONAL	APPOSITIONAL
VERBAL INTELLIGENCE	PERFORMANCE INTELLIGENCE
LINGUISTIC TRANSFORMATION	CONFIGURATIONAL PROCESSING
RIGOROUS & ANALYTICAL PLANNING	PLAYFUL EXPERIMENTATION
TIME ORDERED SEQUENCES	TIME-INDEPENDENT STIMULUS PROCESSING
ABSTRACTING ESSENTIALS	GESTALT FORMATION
VERBAL (SPEECH)	NON-VERBAL
THINKING BY FUNCTION	THINKING BY APPEARANCE
SEQUENTIAL PROCESSING	MULTIPLE PROCESSING
LINEAR PROCESSING	SIMULTANEOUS PATTERNS
SELF AS SUBSET OF WORLD	WORLD AS SUBSET OF THE SELF
EXECUTIVE (directed, purposeful, and controlled)	RECEPTIVE
CONCEPTUAL	EVOCATIVE
KNOWLEDGE	SENSITIVITY AND AWARENESS

Adapted from: Some Educational Aspects of Hemispheric Specialization by Joseph E. Bogen, M.D., UCLA Educator, Spring 1975 (Vol. 17, No. 2.)

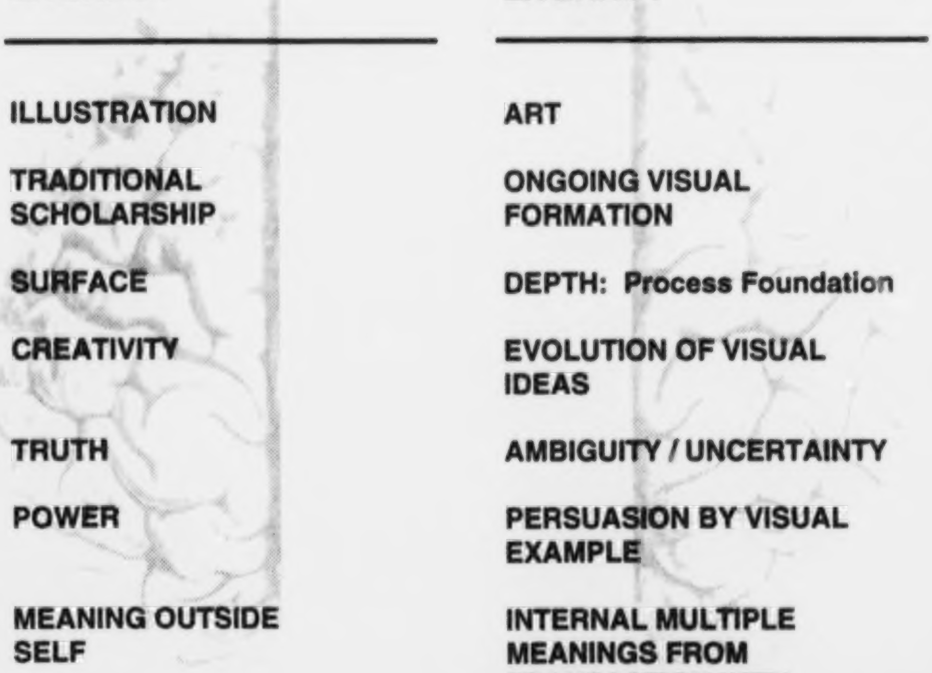
complex interpretation of meanings in visual form are explored and critically studied, visual literacy will be most soundly based as an educational discipline. The right hand column of chart # 2 provides some food for thought concerning the way specific mental processes might effect the study of visual literacy. Education based on this type of study could make a singular contribution to human mental development.

Processes that Count

There are two process-specific based areas in which visual literacy can make unique contributions to human thinking and understanding. These are: (1) the generative functions of graphic ideation and (2) the unique epistemological characteristics of visual interpretation.

Visual language's dynamic generative functions are well established as a discipline within the visual

Chart # 2: Process Specific Issues Applied to Visual Literacy



ABOUT VISUAL LITERACY	OF VISUAL LITERACY
ILLUSTRATION	ART
TRADITIONAL SCHOLARSHIP	ONGOING VISUAL FORMATION
SURFACE	DEPTH: Process Foundation
CREATIVITY	EVOLUTION OF VISUAL IDEAS
TRUTH	AMBIGUITY / UNCERTAINTY
POWER	PERSUASION BY VISUAL EXAMPLE
MEANING OUTSIDE SELF	INTERNAL MULTIPLE MEANINGS FROM TRANSACTION WITH OBJECTS

arts. Visual literacy education should seek to explore, debate, discuss, and understand all aspects of these formative processes that result in forms of visually literate communication. As the artist Paul Klee observed, " Form is the end, death. Form-giving is movement, action. Form-giving is life." (Spiller, 1961) The generative process is dramatically revealed in the preparatory work and early stages of form making that precede the completion of a finished image. Understanding the dynamics and patterns of this productive thinking process will provide visual literacy with essential, teachable thinking skills.

Visual interpretation of meaning provides a second challenging specific mental process in which visual modes of inquiry offer a truly unique second way of knowing. Diagram #1 symbolizes this process as an integral and reciprocal partnership with graphic ideation. Each act of form-making includes for the creator integrated and receptive acts of interpretation. For an eventual viewer of the form, re-creation in personally meaningful terms within the mind must be accomplished before the creative act of visual communication is complete.

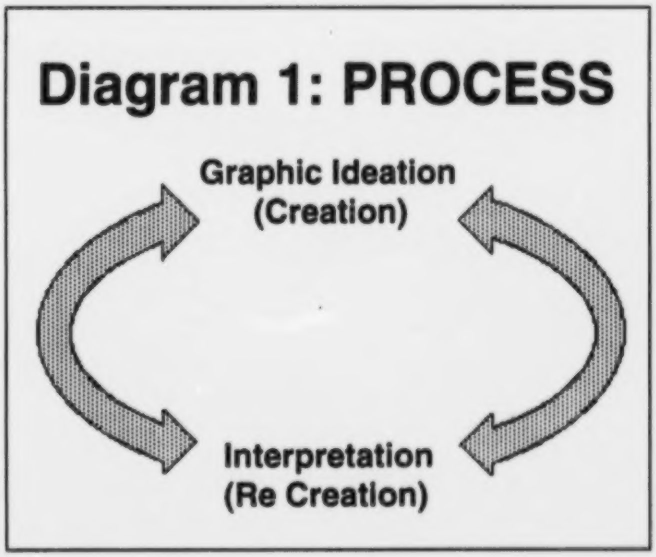


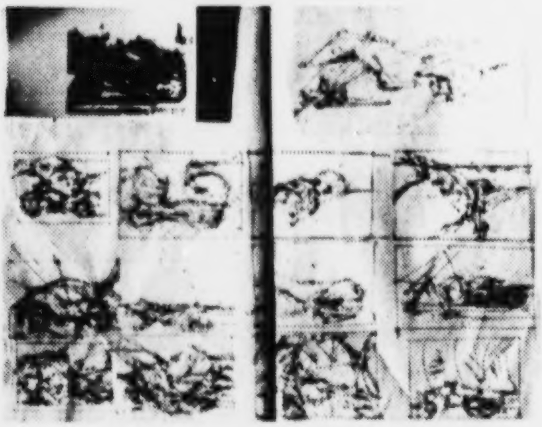
Diagram 1: PROCESS

Graphic Ideation

It is common in discussing how new visual messages are brought into existence to use the term "creativity". Creativity implies that new forms are brought into existence out of the nothingness of unformed raw materials. This view is not supported by the actual visual evidence from artist's and designer's sketchbooks. Preparatory drawings, and three dimensional maquettes from the work of professional visual communicators clearly show that visual ideas evolve, slowly and patiently, over often long periods of sustained disciplined work. One sketch leads to another or simply suggests an interesting possibility that may not even be immediately useful. Two visual configurations, through playful experimentation, can combine into a third form, not predictable from its component parts. While the final solution may seem to occur in an insightful flash of intuitive creativity, this is not the experience shown in the disciplined and productive visual evidence.

Visual thought, the visual evidence indicates, is carried on in a wordless medium of visual form to visual form activity. The basis of this thoughtful process of visual thinking is an abstract configuration of lines, shapes, colors, and values, perceived without reference to what that configuration may signify in the external world. This abstract essence of visual thought is perhaps what the scientist David Marr called, "a primal sketch" (Marr 1982). Many professional artists refer to this activity as "Seizing the Glimpse". The glimpse is described as a very small abstract flash of recognition and understanding.

The work of artist David Ulch shows this process of thinking by visual means alone (abstract configuration to abstract configuration). His process demonstrates a kind of purposive flexibility (an openness to imaginative possibilities of, as yet, vague purpose). Shape and form possibilities are, in this fluid mental state, combined freely and the final work slowly evolves into its final expressive form. Lessons are, of course, learned during this process through reflection on developing form.



Ideational Studies from Motorcycle Demonstrating:
- **Flexibility**
- **Fluency**
- **Combinative thinking**

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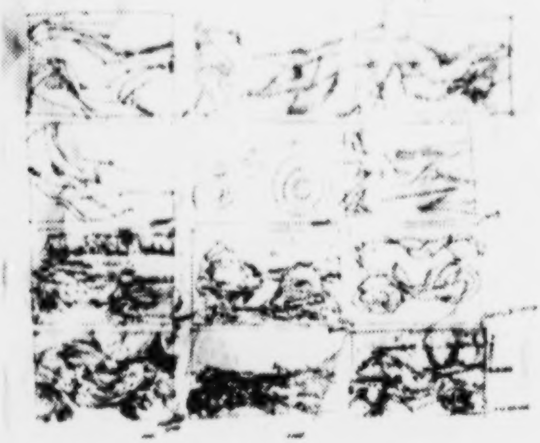

Further Graphic Ideation Studies Demonstrating:
- **Further configurational processing**
- **Grasping of abstract "glimpses"**
- **Flexibility and Fluency**

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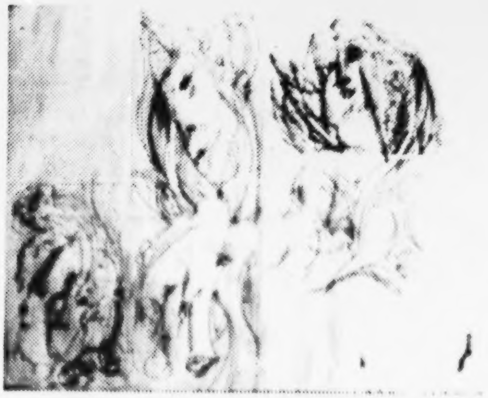

Additional Visual Thinking from Motorcycle Source

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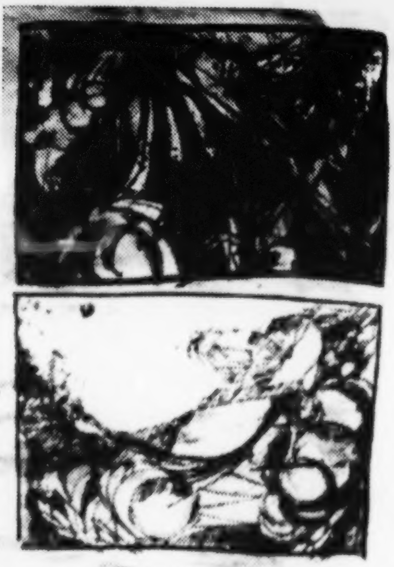

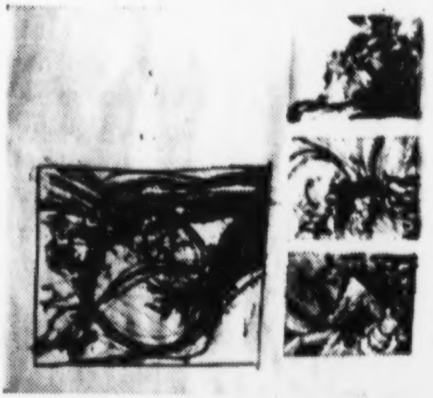

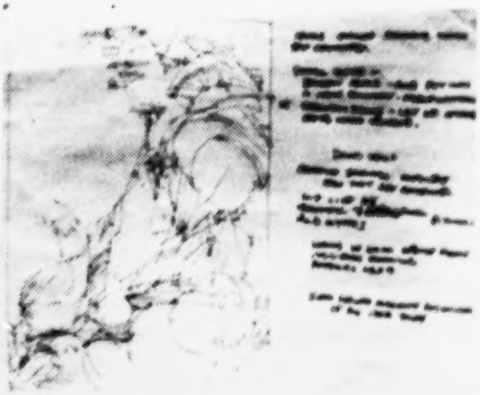

Impressions of a Motorcycle
Etching 6 x 8 inches

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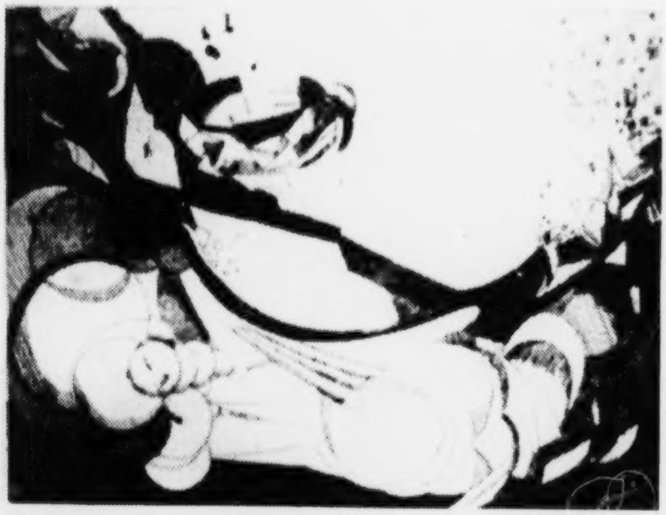

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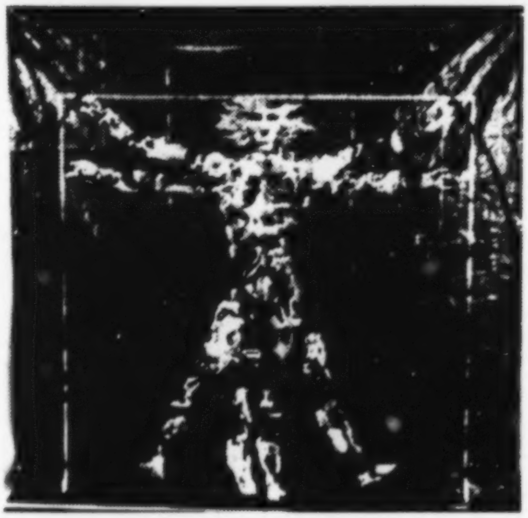
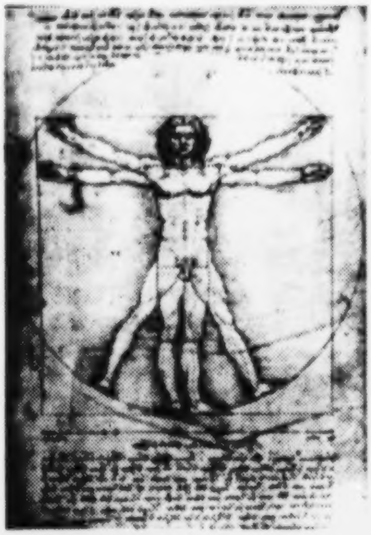
This visual thinking is also characterized by a continual search for an authentic voice of originality. The example provided by artist Kristin Tow Meadows demonstrates an intriguing solution to a purely visual search for original form. This large collaged image reflects an insight by the artist of her deep personal involvement with art history. The origins of this form lie in earlier periods in the history of art. The source was a particularly significant contact with her true interests in life (her origins).

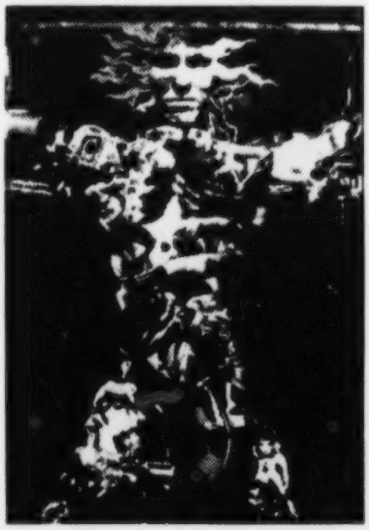


Commentary on Modern Man - Collage 8' x 8'
Copyright Kristin Tow Meadows
Used with permission of the artist

Originality, according to psychologist Rudolf Arnheim, has little to do with a conscious decision to be different and unique. The experience of originality arises naturally out of intuitive discoveries, in form language, of the roots of the unique self. In the example shown here, the artist found in a drawing by Renaissance artist, Leonardo Da Vinci, entitled, "Virtruvian Man," (which speaks to the symmetry and harmony of the ideal human) a significant configurational and ideational base for further her visual thinking about the nature of modern human life.



Virtruvian Man
Leonardo Da Vinci



(Detail) Commentary on Modern Man
Copyright Kristin Tow Meadows

The hundreds of years that separate Leonardo from our own time are not recognized by the specific processes of the right hemisphere. In this case the artist has substituted collage images of the clutter of contemporary culture to show a contrast with the orderly image from the past. The artist has incorporated a deeply personal, yet borrowed, interest as the base of visual formation. This borrowed structural foundation does not however represent a privileged new platform from which to pontificate on a totally new perspective . It is rather a deeply felt position, with borrowed references, from the artist's own roots in interest, thought, and feeling.

Visual Interpretation

The interpretation of visual images is problematic for the visual literacy researcher, since there is almost an automatic assumption in western culture that interpretation is only possible through left hemispheric specific processes. Interpretation is assumed to be an analytical function aimed at knowledge formation through the abstracting of essentials. Visual interpretation seems to function otherwise.

Visual interpretation is based more heavily on the specific processes that scientists have identified as right hemispheric in character. In an earlier time the philosopher John Dewey characterized this process as a kind of transactual psychology. Rather than postulating a neutral, objective observer discovering knowledge embedded in the exterior world, transactual psychology suggests that humans understand their environment through a continual "bargaining" process between what is inside them and the exterior world outside their skin. In this bargaining process each person constructs his or her perceptions through a filter of past experiences, assumptions and purposes. Each person, because of differing experiences and associations, perceives what is "out there" in a largely unique way. There is no common world out there, only common ways of transacting, common bargains.

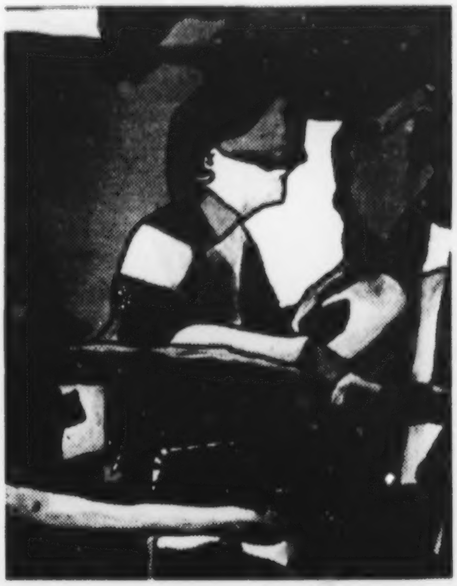
For the individual interested in visual literacy there is an imperative to avoid the executive, dominating functions of left hemispheric linear thought. A world in which what is perceived is dictated over by the words assigned to describe experience does not value a literacy that is visually based. Visual literacy implies that the meaning one constructs is not something that comes from the object but from the active internal experience one has when viewing the object.

Viewer Response Theory

What is needed in visual literacy is a visually mediated process to deal with this infinitely variable bargaining process of transactual interpretation. In literary criticism the methodology which seeks to deal with this complex interpretative process is called reader response criticism. I am proposing that a similar methodology would be equally useful in visual realms of experience, a viewer response criticism.

Viewer response theory would move the focus of attention away from the visual object and toward the viewer and their transactional bargains with the object. What this type of interpretation would seek to discover has to do with the viewer's share of the creative process which re-creates the object within the viewer's mind. Viewer response criticism must avoid assigning any absolute meaning or truth to interactions with the object. Objectivity, as far as it exists, can only be said to reside in an understanding of the process-specific way that a particular viewer or group of viewers transacts with the object.

The goal of viewer response methodology might be said to be the merging of the self and the object (the other). Instead of an object oriented formalistic analysis, the viewer is empowered to base interpretations of his or her own perceptions on a natural "birthright". Expertise for the person practicing viewer response criticism resides not in external others (whether they are people or objects) but in the intimate knowledge of one's own perceptual processes. This type of interpretation solidly re integrates visual knowledge into normal human discourse from which formalism and objectivism have removed it. Each viewer (even the person viewing the initial form-making of his/her own hands) is empowered with expertise based on personally lived experience.


Multiple Perspectives Painting
High School Copyright New Art Basics

In addition to objectivity, visual response theory effects the positionality of the interpreter. Rather than the single eyed, stationary, objective observer of the Renaissance, this new world of viewer response interpretation posits that each viewer will always have simultaneously multiple perspectives on meaning. This is so because of the multitude of associations that visual elements in any visual scene suggest. This simultaneity of position is very much like the reality suggested by relativistic physics and modern cubist painting. This type of complex visual reality can itself be studied visually as shown in the accompanying painting done from multiple vantage points by a high school art student.

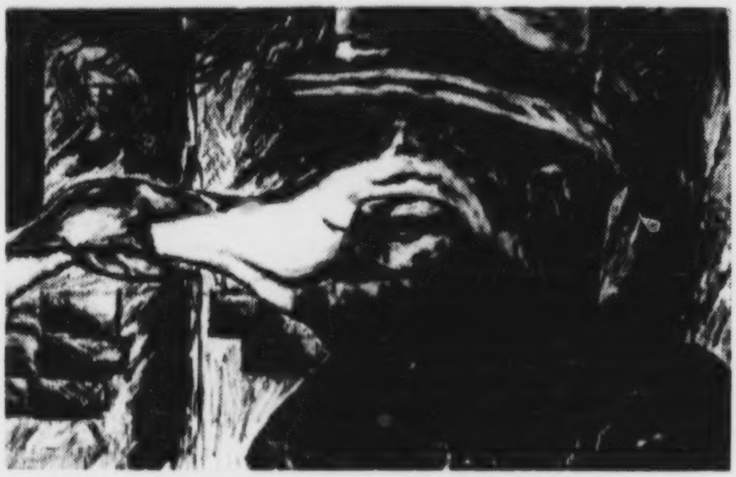
Those individuals who share a significant portion of the interpreter's perspectives would constitute an interpretative community with shared assumptions. The sharing of meaning is possible in that two or more persons share overlapping in their respective interpretive communities. The interpretative viewer can make a meaningful connection with the original maker of a form when he or she discovers a way to relate to (transact with) the object in much the same way as did the original creator.

Meaning that is based on right hemispheric specific processing is not a "set" and unchanging thing. Something may come to mean one thing now and another thing later. The viewer may tap into one level of meaning at one point in time and, given the changing circumstances of life experiences, perceive this same form as a quite different level of meaning at another time. Out of a complicated and ambiguous process meaning (or rather meanings) will continually evolve from any visual. The potential for a number of meaningful associations is clearly demonstrated in a high school student's drawing, "The Real Me."

Multicontextual not Unicontextual

All thinking outcomes that provide new knowledge involve a fusion of previously unrelated ideas, planes of thought, or contexts. The Canadian psychologist, George Swede has, for example, characterized all creative thought as multicontextual.

> *"To express the idea that more than two planes of thought are always involved in creative thinking, I suggest the term "multicontextual thought." It makes clear that anything creative is the result of the integration of a number of different concepts or contexts..."* (Swede, 1993)

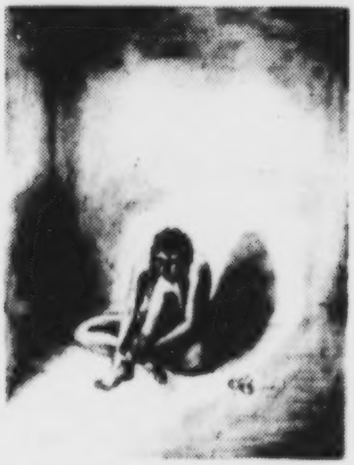


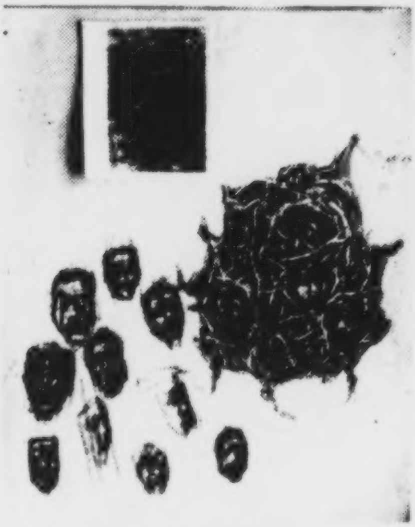
The Real Me, High School Student
Pencil Drawing 16" x 24"
Copyright New Art Basics Project

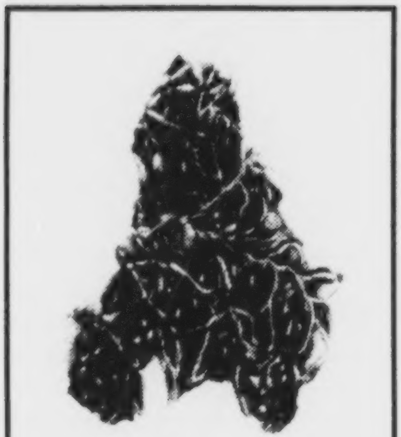
Creative graphic ideation and visual response interpretation are both in this way multicontextual rather than unicontextual. With multiple, simultaneous processing in the right hemisphere, many contexts apply within the viewers mind to any visual perception. These multiple, relevant contexts make possible the multiple-leveled meanings of metaphoric thinking in visual communication.

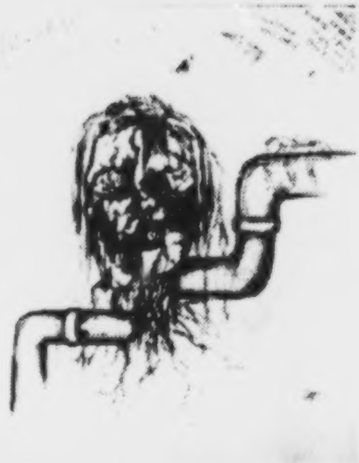
The metaphoric, visual development of graphic forms are shown in the developmental sketches of artist

Gretchen Raisch for an expressive self portrait. Many of the metaphoric contexts are explored during the sketching process from which she developed the final form. The moodiness of the first sketch suggests a context of human isolation and introspection while the next two drawing pages show an attempt to integrate this self embracing figure with a "bramble patch" of twisted veins/ vines. From the dark recesses of this twisted organic thicket emerge many alien faces or forces. The final formative drawing integrates these separate contexts into a single form, multicontextual and metaphoric in implications. The self portrait, breaking or tearing into its constituent parts, mirrors the surrounding plumbing

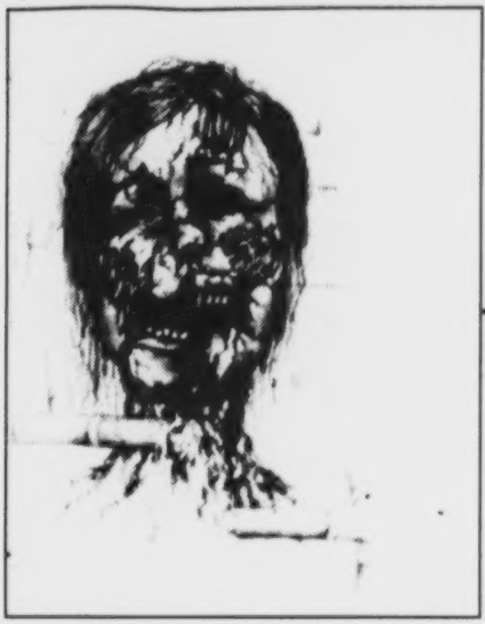

Untitled Figure Drawing


Drawing of Bramble Patch


Combination Drawing (Bramble Patch and Figure)


Preparatory Drawing Self Portrait

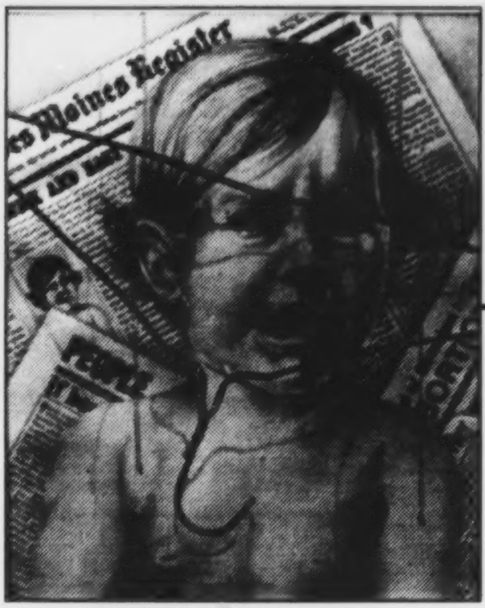
All drawings this page. Copyright Gretchen Raisch. Used with permission of the artist.



Self Portrait 14" x 16" Pencil
Copyright Gretchen Raisch.
Used with permission of the artist.

Possible Multiple Levels of Meaning

1. Personal Struggle
2. Structure of a constructed world breaking down
3. Disolution of an organic wholeness
4. New relationship between human and environment
5. New forms / potentials emerging



Abortion 10" x 12" Pencil
Copyright Ronald Heinen
Used with permission of the artist.

Different Multicontextual Associations

1. Coat hanger abortions
2. Issue in newspapers
3. Meat hook
4. Shadow on the unborn
5. Slashing angles
6. Newspapers spread as if to protect against a messy operation

environment/infrastructure.

The multiple analogies that are possible from these visually rich contexts must seek a type of metaphorical coherence focused on significant attitudes or positions in relation to humans and their relationship to the universe. It is not necessary to reduce these multiple contextual positions into a single meaning with left hemispherically specific processes. There may be multiple possible levels of meaning that have a thematic unity. Meaning at multiple levels of understanding can be simultaneously truthful and poetically significant. This richer and thicker critical understanding of the visual message can lead to a richer self identity for the viewer. It also serves as a limiting factor on a kind of interpretative nihilism.

The artist Pablo Picasso anticipated the importance of understanding this sort of right hemispherically mediated visual thinking when he said,

> *"Why do you think I date everything I do? Because it is not sufficient to know an artist's works - it is also necessary to know when they did them, why, how, under what circumstances.... Some day there will undoubtedly be a science - it may be called the science of man - which will seek to learn more about man in general through the study of creative man."*

Perhaps visual literacy is now called upon to develop such a visually based science.

VISUAL PROCESS LINGUISTICS

PSYCHOMORPHOLOGY

VISUAL LOGIC

BISOCIATION

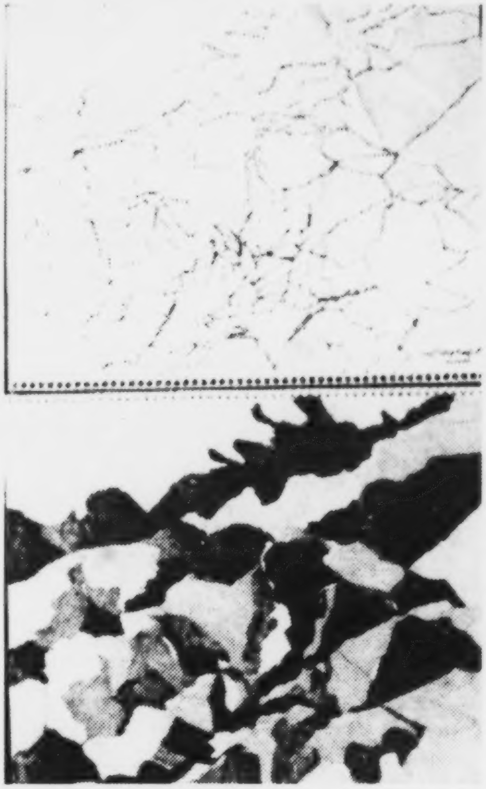
Visual Process Linguistics

Visual literacy could contribute to a "science of creative humanity" with visually literate scholarship. We could seek to define and understand visual thought in purely visual modes of exploration and discourse, a kind of visual process linguistics. This visual based world could provide for its own brand of phonetics, phonology, morphology, syntax, and semantics. These new disciplines would not, however, be simply grafted onto existing linear and verbal based linguistic traditions. Visual process linguistics should provide multiple visual perspectives to an "interpretative community of the imagination". Here are several suggestions for methods of visual process linguistic inquiry:

Psychomorphology

Morphology is defined as the scientific study of form and structure, as of an organism, regarded as a whole. This biological connection makes clear the holistic manner in which form and structure must also be explored in the visual sphere of experience. Perceptions, concerning the nature of creative thought, can yield a rich and ever evolving body of concrete perceptual insights when explored by purely visual holistic means.

From an ambiguous visible world, new forms will continually arise in the viewer's consciousness through a rich discipline that could be called, psychomorphology. Psychomorphology as a discipline would enrich understanding of the functions of the visual mind. From childhood to adulthood individuals can explore the nature of their transactions with the world.



Spirit in the Crumpled Paper Exercise
Rocky Landscape
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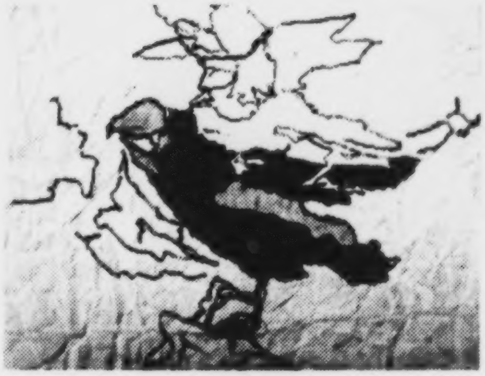
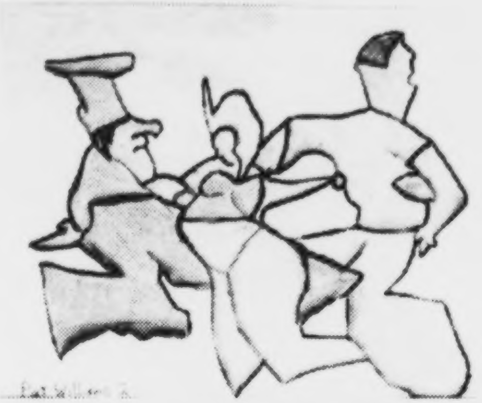
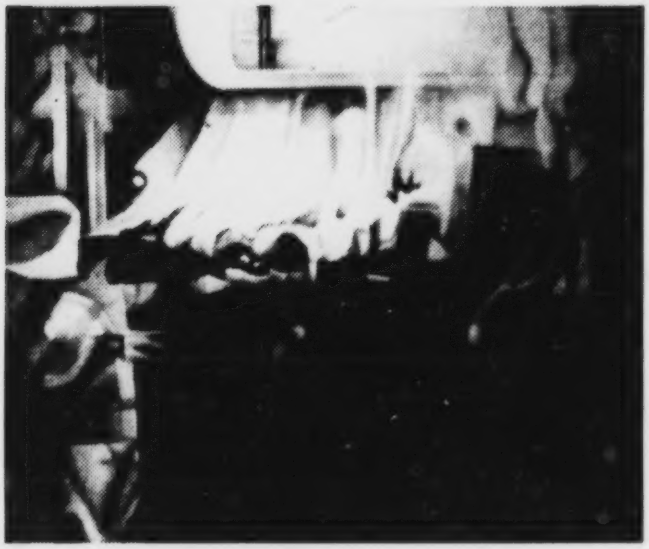


Spirit in the Crumpled Paper Exercise
Bird
Copyright New Art Basics Project

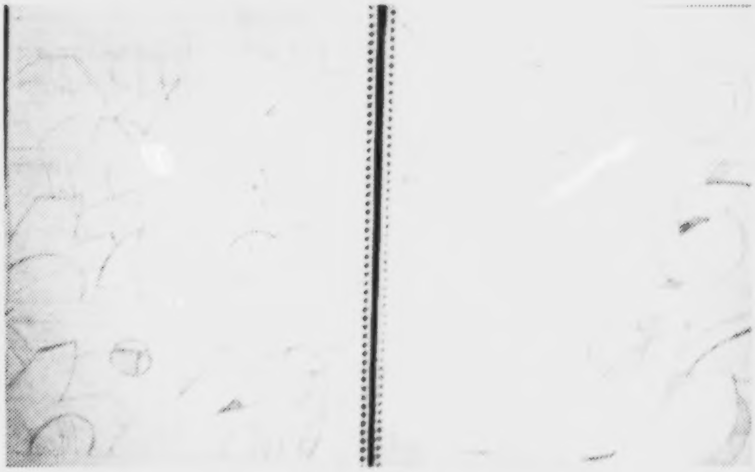


Spirit in the Crumpled Paper Exercise
Dancing Figures
Copyright New Art Basics Project

In student examples for an activity called, "Spirit in the Paper" young artists convincingly demonstrate that, even in a randomly crumpled sheet of white paper, the interpretative visual mind will create meaningful transactions. These interpretative transactions may be given names such as rocky landscape, bird, or dancing figures. The names are less significant however than what these transactual bargains tell us about the functions of the individual interpreting mind. An example of the author's own psychomorphology experiments, a painting entitled, "Spirit on the Land," demonstrates how a deliberately ambiguous figure can evoke a wide variety of possible interpretations.



Spirit on the Land
Acrylic Painting 30" x 36"
Copyright Dennis M. Dake

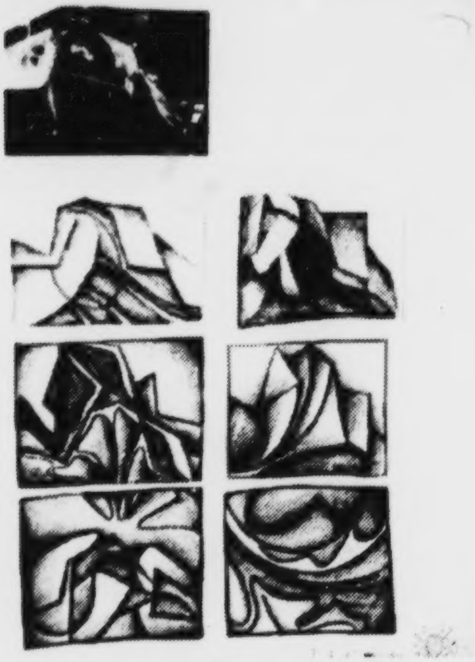


Sketches - Copyright Gigja Baldursdottir
Used with permission of the artist

Visual Logic

Visual language also has a distinctive process-specific form of syntax. This syntax is clearly not rule driven in the same way that verbal syntax is. Rather, it seems to follow a kind of holistic visual logic that seeks the original synthesis of new gestalt wholes based on allowable perceptual functions within the visual perception system. The author Edmund Blair Bolles in his 1991 book, "A Second Way of Knowing: The Riddle of Human Perception," lays out the case for this gestalt based way of knowing. I would define visual logic in the following manner.

VISUAL LOGIC: A characteristic of visual designs that are said to "work." It is characterized by a sense of cohesiveness, comprehensibility and internal integrity among all its elements. Visual logic is based upon a belief that each person has an internal, intuitive teacher which he or she can learn to trust for guidance in the development of visual forms.



Sketches looking for the visual logic in a junk yard inspiration
Copyright Gigja Baldursdottir
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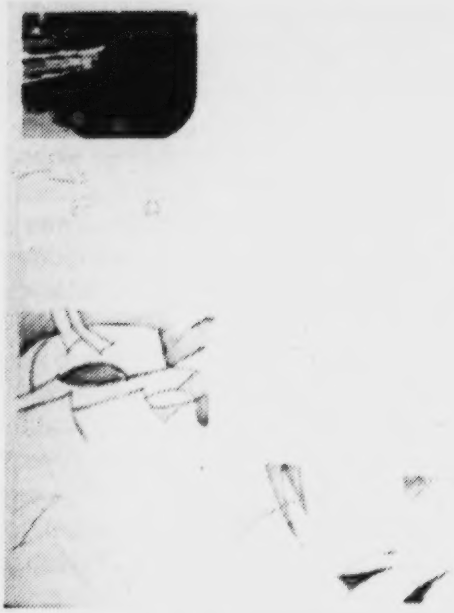
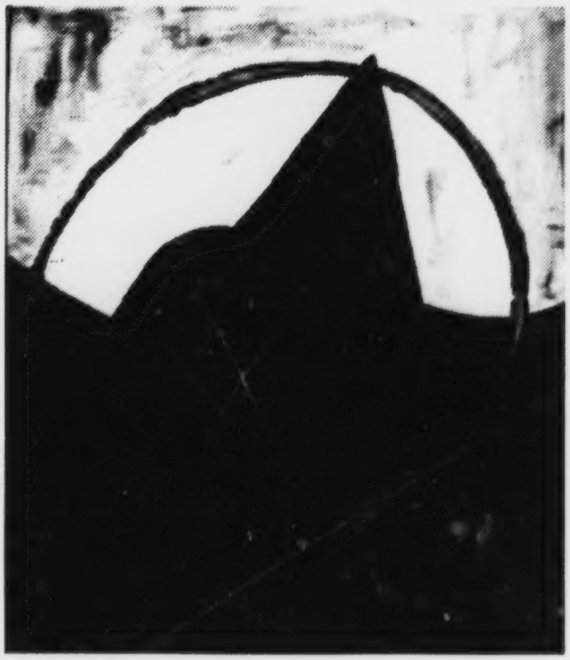


Developmental Sketches
Copyright Gigja Baldursdottir
Used with permission of the artist

This process of shaping a meaningful visual message from the raw material of the world requires the slow evolution of visual formation with intervening processes of visual interpretation. This visual logic process is demonstrated in visual to visual action of four pages of thoughtful experimental sketches by the artist Gigja Baldursdottir. The resulting untitled abstract painting demonstrates the fruits of this labor after visual logic.



Untitled Painting
Acrylic on Canvas
Copyright Gigja Baldursdottir
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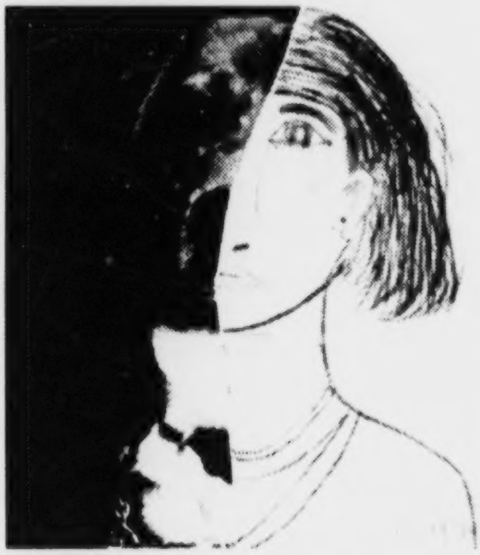
Bisociation

Phonology, the study of speech sounds, could also have its corollary in the visual world. Arthur Koestler, in his 1975 book, "The Act of Creation," proposed that all creative ideas arise from a mixture of qualities hidden in previously unrelated or unassociated objects or contexts. This cross fertilization of unrelated ideas and associative contexts within a single human brain produces new ideas whose shape and form cannot be predicted from the constituent parts. Koestler called this process bisociation, to distinguish it from more pedestrian associative thinking.



Animal Instinct Pencil and Photo
Elementary Student
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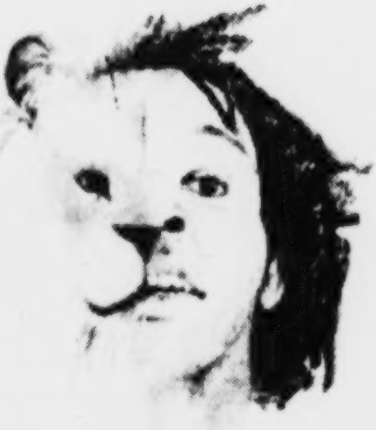
In the visual world, a similar kind of merging of visible qualities is at the heart of the formation of new visual thoughts (configurations).

Student examples from both elementary and secondary school levels show the potential for the visual study of bisociation. Bisociation can lead to visual solutions which sensitively make us aware of new poetic meanings in the world.



Animal Instinct Pencil
High School Student
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TYPES OF LINGUISTICS:

DESCRIPTIVE

HISTORICAL

COMPARATIVE

THEORETICAL

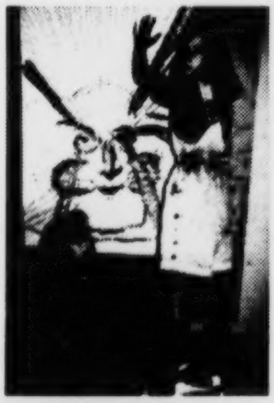
GEOGRAPHICAL

Types of Visual Process Linguistics

Visual Process Linguistics could take on many forms of purely visual inquiry. In closing let me suggest how, by analogy, visual scholarship might yield methods of inquiry complementary to those found in verbal linguistics.

1. Descriptive Linguistics - This form of inquiry would seek to comment on the multicontextual understandings, gained from interacting with visual configurations, through the creation of a richer, thicker descriptions in new visual form.

Three student examples from an activity called, "Metaphoric Face" show how visual researchers can mix and unify contexts from a variety of sources, while being guided by acts of visual response interpretation. These examples from middle school, high school, and college age levels demonstrate that individuals of all ages can engage in this type of activity to improve their visual literacy.



Design a Metaphoric Face from the poetic mixing of many visual qualities.

Middle School level students

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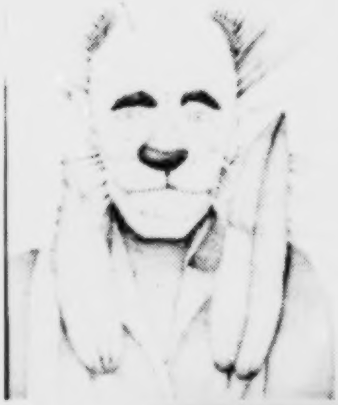
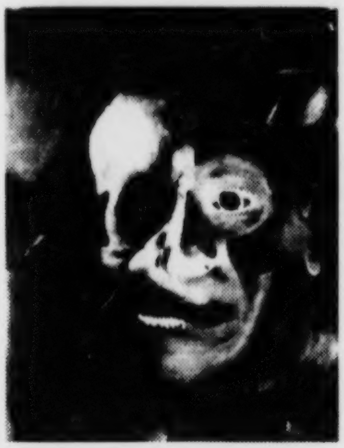
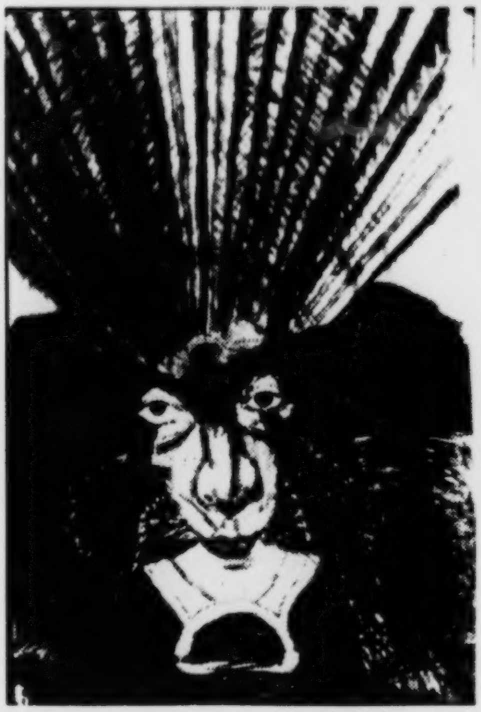
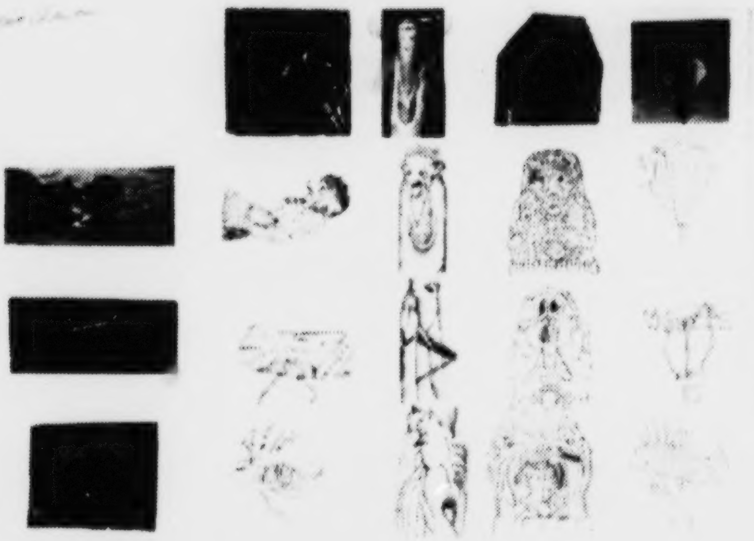


High School Students



College Students





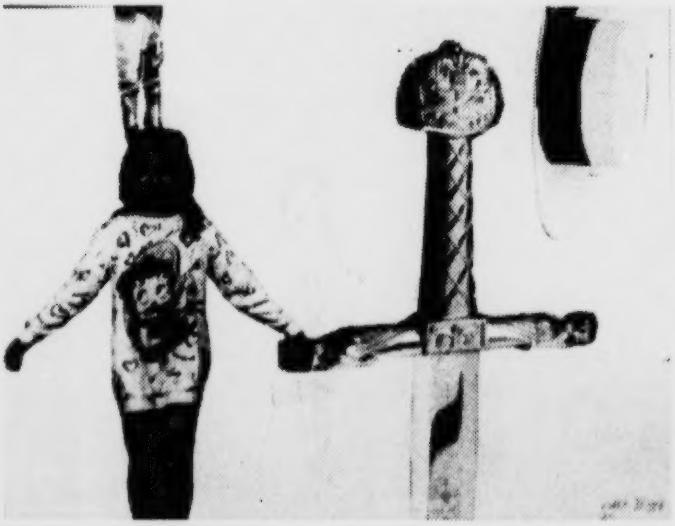
Combinative Grid Exercise

Middle School level

Copyright New Art Basics Project

2. Historical Linguistics - This type of visual process linguistics would seek to discover sources of original linguistic stock from which visual language systems and styles have evolved. The example provided from a middle school student shows how in a visual thinking activity called "Combinative Grid," there is careful and critical visual study of such historically based sources.

3. Comparative Linguistics - Visual to visual comparisons can be particularly lucrative in considering the flood of possible associations and bisociations a visual suggests. Compare for example the three previously mentioned examples of "Metaphoric Face." What fruitful observations could be made about the different ways in which these students transacted with their visual environment?



No Way Jose

Bisociation Comparison Exercise

Middle School level

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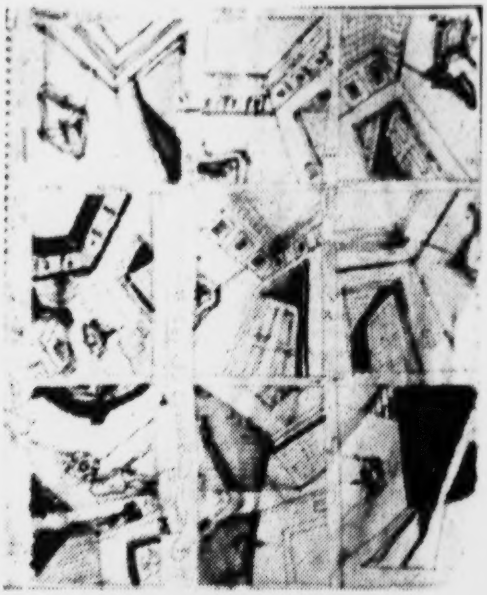
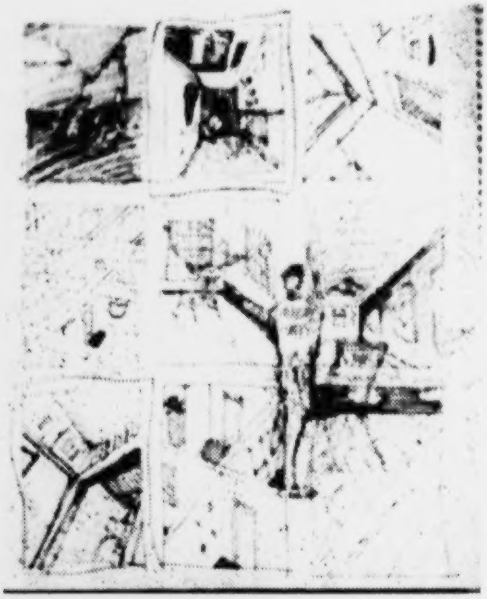
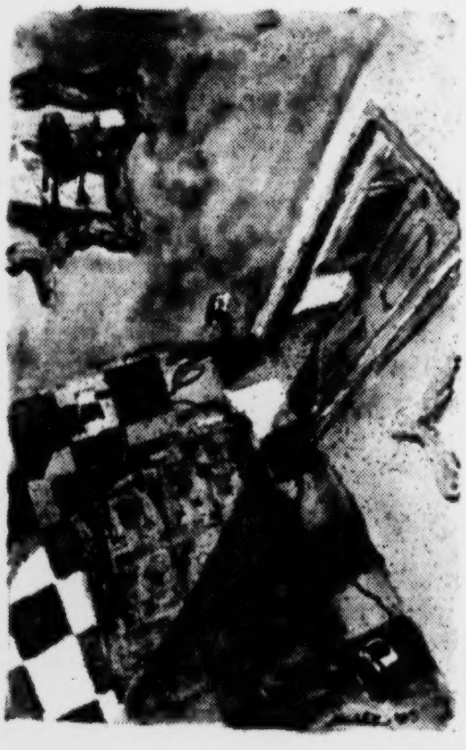


Developmental Sketching



Developmental Sketching

4. Theoretical Linguistics - The creation (evolution) of original images through a process of disciplined visual thought holds many theoretical possibilities. Artist Bill Miller demonstrates in his sketchbook the search for an expressive form to convey his psychological impressions of a room in just such a visual and theoretical quest.



Bill Miller
Impressions of a Room: A Theoretical Exploration of Meaning
Watercolor 12" x 14"

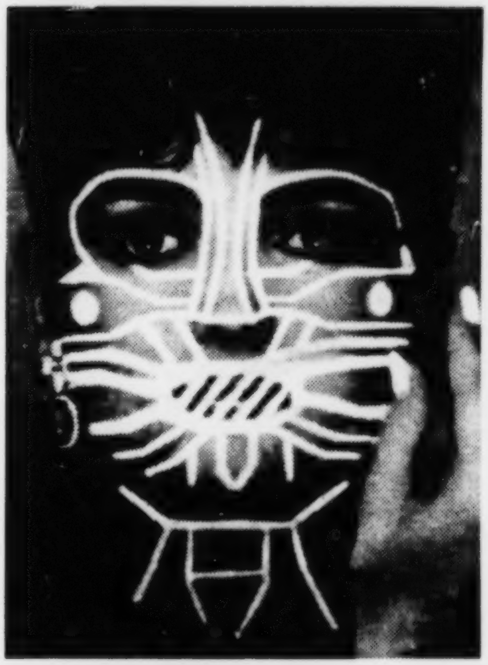
All images on this page. Copyright Bill Miller. Used with permission of the artist

5. Geographical Linguistics - Exploration of multicultural visual languages might yield startling comparisons and universal human traits. In my final example one can see a student altered photograph exploring the significance of face painting, scarification, tattooing, and cosmetic makeup. This activity, called "Face Doodles," allows the viewer to make original observations and discoveries of a purely visual nature.

Conclusion

The experience of visual literacy ought to be as much or more a visual adventure, requiring critical production and seeing, than it is an experience of verbal discourse about visual matters. This requires more participatory visual action and qualitative research methodology than is currently demonstrated in the professional literature concerning visual literacy.

The process issues defined in this paper have many pedagogical and curricular implication for educators. Education can no longer afford to continue with methods that, media critic Marshall McLuhan characterized as, "stenciling on brain pans." In a visual literacy program, individuals must be required to actively explore the transactual nature of both their graphic ideation and visual interpretation processes. These process issues underlie and are constituted by all past, present and future images.



Face Doodles
Multicultural Exercise
Copyright New Art Basics Project

Visual language, with its dynamic and every changing functions, can provide a great educational benefit to human thought but as the poet Longfellow said, "Art is long and time is fleeting." It is time for the visual literacy movement to develop a greater focus on long term process issues.

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From Iconic to Lingual: Interpreting Visual Statements

Deborah Curtiss

In an age of proliferating visual communication we face a permissiveness in subject matter, content and meaning that is exhilarating, yet overwhelming to interpret in any meaningful or consensual way. By recognizing visual statements—whether a piece of sculpture, an advertisement, a video, or a building—as communication, we can approach their interpretation on different levels and in a number of different ways. In support of my central thesis—that a visually literate approach to interpreting visual statements must be a flexible, context-relevant, ongoing reinterpretation and reevaluation—we, as visual literates, have an obligation to explore a variety of perspectives: art historical, mass communications, perception psychology, semiotics, hermeneutics, etc

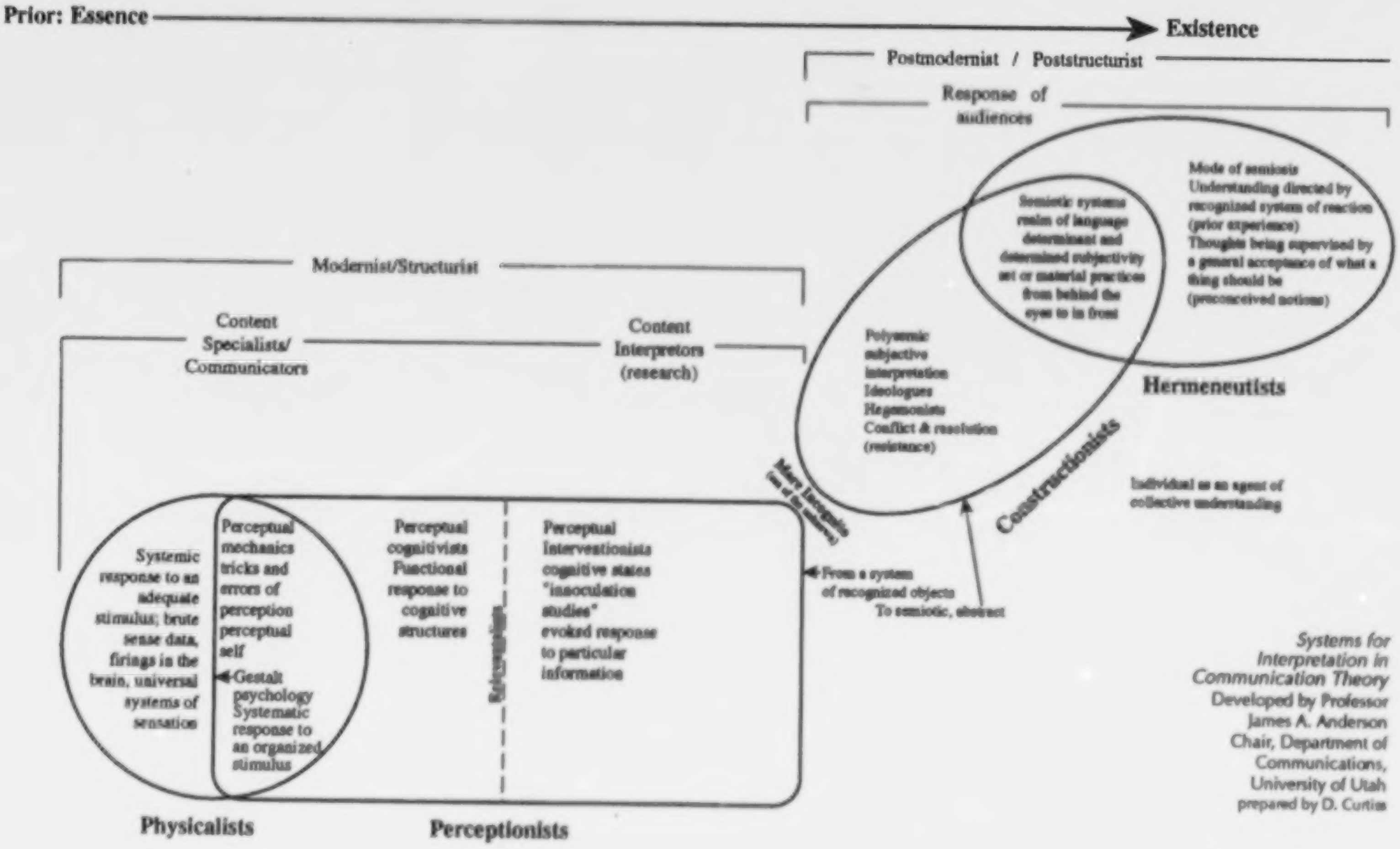
At IVLA '93 I presented a summary of art historical approaches: pre-modern/connoisseurial, modern/structuralist and post-modern/deconstructionist/social.[1] In this, the second of a minimum of three papers that I envision to overview these multiple perspectives, I intended to investigate and summarize how mass communications theorists and perceptual psychologists navigate the transition from the iconic to the lingual to illuminate interpretation of visuals.

Upon undertaking this challenge, however, I bogged down in an overwhelming body of material. What business do I, a visual artist, have in taking the time from my work to become more than cursorily informed? I want interpretation of visuals to be vital, exciting, joyful. Would attempting a synopsis of this vast realm contribute anything, or burden the interpretation process?

While I mulled these questions, I turned to see what people in mass communications have to say about interpretation. Initially, I found little, and most relied upon cognitive psychology. Considering my limited proclivities, cognitive theory threatened to cast more shadow than light on my quest. When I consider that the leap from iconic to lingual has been a central part of my professional life for more than 30 years, the last thing I wanted is for the dynamic process to become engulfed by concepts and theory.

Pressed to have something to offer at the conference, I remembered a presentation at the 1993 International Visual Literacy Symposium on Verbo-Visual Literacy in Delphi, Greece. Professor James Anderson, Chair, Department of Communications at the University of Utah, addressed interpretation in communication theory. The proceedings of the conference were still in production, so I had not seen his paper, but I remembered his quickly dashed on the chalk board diagram. It depicted the historical development of the topic from early theorists to the present.[2] From a sketch of his sketch, I prepared the diagram which, having passed his review, is reproduced herewith. It schematically represents the development of physical, perceptual, constructionist and hermeneutic theories, and illuminates the complexity of the issues and process. While Anderson makes no distinction for visual rather than verbal communications, I refer the reader to his article for a synopsis of multiple theories.[3]

Probably no one can arrive at a concise, definitive statement about how we navigate



Prior: Essence → Existence

Postmodernist / Poststructurist

Response of audiences

Modernist/Structurist

Content Specialists/ Communicators

Content Interpretors (research)

Mode of semiosis
Understanding directed by recognized system of reaction (prior experience)
Thoughts being supervised by a general acceptance of what a thing should be (preconceived notions)

Semiotic systems realm of language determinant and determined subjectivity act or material practices from behind the eyes to in front

Polysemic
subjective
interpretation
Ideologues
Hegemonists
Conflict & resolution
(resistance)

Hermeneutists

Constructionists

Individual as an agent of collective understanding

Mere Incognito

From a system of recognized objects
To semiotic, abstract

Systemic response to an adequate stimulus; brute sense data, firings in the brain, universal systems of sensation

Perceptual mechanics tricks and errors of perception perceptual self

Gestalt psychology Systematic response to an organized stimulus

Perceptual cognitivists Functional response to cognitive structures

Perceptual Interventionists cognitive states "innoculation studies" evoked response to particular information

Physicalists

Perceptionists

Systems for Interpretation in Communication Theory
Developed by Professor
James A. Anderson
Chair, Department of Communications,
University of Utah
prepared by D. Curtiss

Semiotic Focus: Sign as representation — Semiotic object — Relationship
Interpretation: Factual — Evocative — Invocative — Achieved
Individual: Attribute — Conjunctive — Activated

the transition from visual to verbal, a process that can simultaneously feel like a yawning chasm and a dense thicket. Interpretation of visuals and visual experience is, however, an issue that we must address, attempt, and encourage our students and colleagues to think and talk about. As we become knowledgeable about different perspectives, we need not chose one perspective over another, but can achieve a synthesis of multiple approaches that enrich our experience with the visuals we chose to come to know and understand.

Toward that objective, I offer two lists that outline the various perspectives and categories of an eclectic, inclusive interpretation process. In the first, the basic relationships between images and language is indicated.

Perspectives of Interpretation of Visuals

Art history iconic↔lingual
  pre-modern: connoisseurial/traditional
  modern: structuralist/formalist
  post-modern: deconstructionist/ social

Perception psychology a-iconic/lingual
  identifying, naming, labeling images
  representation-dependent
  related to consensual reality
  phenomenological/theoretical

Communications theory
  cognitive psychology iconic↔lingual
    recognition to understanding
    cognitive, social content/context
  semiotics iconic→lingual
  hermeneutics iconic→lingual
    explanation, active process

Literary
  applications of literary theory/criticism
    to visuals lingual→iconic

Epistemology ❯↔❮

Coming to understand the communicative aspects of visuals entails interpreting the content as it is meaningful to the viewer. This requires that the viewer/interpreter recognize the validity of her/his own experience, thinking and views. It can encompass the intent of the creator, if known, but knowledge of that intent cannot be considered essential to the interpretation or interpretation process. Many assume interpretation also implies evaluation, passing a value judgment on the worth of a visual. This too is only a possible component, not a requirement. Feinstein suggests that evaluation is a *natural* part of the interpretation process, and includes it among categories of interpretation of visuals.[4]

While I have expanded upon Feinstein's categories slightly, I acknowledge her contribution to the following outline.

Categories of Interpretation of Visuals

Description
  labeling, a general inventory of what is seen
  representation-dependent
  may lead to a literal, consensual reality-grounded interpretation
  cognitive, factual

Structure
  analysis to determine how the image was composed or constructed
  how the medium and underlying structure support or undermine the strength of the visual

Historical
  takes into account influences, context, environment and/or situation

Social/political
  relates to contemporary context
  protest, elucidation, persuasion

Metaphor
  subtle, indirect content that may be anagogic, poetic, inspirational, spiritual

Evaluation
  how a visual compares with known or held values, preference/bias, prevailing standards
  how it functions in social context, succeeds in achieving identified standards, esthetics.

"Interpretation is an emerging process not an instant. Its activity certainly subsides but need never end."[5] "...images are prone to...distortions from 'reality.'...We extract (and create) meaning from visual stimuli just as we do from text."[6] "We must learn to interpret visual messages in a meaningful way; if passive, we lose control over information which impacts our lives...making meaning is a creative, constructive process."[7]

"Images do not make meanings. Social action changes the way groups experience the world, and therefore, the way they make sense of the world. Social actors make meanings and change meanings. All learners are social actors and the invitations they accept or reject have consequences for themselves and other social actors. What often appears to be a simple 'decoding' of media is really a complex process that involves the acceptance of one set of invitations to construct particular meanings and the rejection of alternatives."[8]

Inspired by these quotations, I conclude that the interpretation of visuals is a rich and rewarding multilevel process in which one will often arrive somewhere that is impossible to anticipate. Like any journey to an exotic place, the effort is its own reward.

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[3] Anderson, op. cit.

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Visual Literacy: What do Prospective Teachers Need to Know?

Cecelia A. Box
John Cochenour

Introduction / Statement of the Problem

The authors of this research have, together and separately, been involved in efforts over the last few years to integrate instructional technology into programs of undergraduate teacher education. Having both come from backgrounds that included training in visual literacy, we agreed that any instructional technology training should include some attention to the topic. Our own experience working with teacher training programs brought us to the conclusion that visual literacy as a concept is not widely understood or valued in such programs, even though there may be implicit references to the ideas of visual literacy embedded in the curriculum.

Our notions were informally supported by an anecdote that appeared in the April, 1994 issue of the *Visual Literacy Review* . Rhonda Robinson described an incident that occurred in her graduate level visual literacy course. As she was introducing the topic of the day, film genres and film language, one of her students spoke up to ask, "...why would anyone want to know this material? What use is any of this?" (p. 2) Robinson goes on to relate her response, and makes a telling observation about those who were most resistant to the topic:

> In fact, the group I most wanted to reach, the classroom teachers, were the least persuaded. They really just could not see what knowing about production techniques, or film language, or media and culture could possibly have to do with them and their classes. (p. 2)

What do prospective teachers need to know about visual literacy? Perhaps one must start with a logically prior question: why do teachers need to know anything at all about visual literacy?

Interestingly, it was a link between education and children's visual experience that, according to Debes, (in Sinatra, 1986), led to the founding of the visual literacy movement: "The Visual Literacy movement sprang up because observant educators and scholars were puzzled by changes they saw in young children after television had arrived in the average United States home. The I.Q. scores of school-entering children were rising sharply; but the numbers of students having difficulty learning to read and write were increasing. Contradictory seeming facts such as these and the classroom observations led to the First national Conference on Visual Literacy". (p. vii)

This question is partly one of awareness and partly one of semantics. Some educators, like those in Robinson's graduate class, are simply unaware of the issues involved in visual communication. Others, in our experience and our conversations with those we surveyed for this study, may actually be teaching skills and knowledge related to visual literacy without having the specific terminology to describe it. Many professors of education, for example, require students to construct posters, bulletin boards, games, or other instructional media, though they may never have heard the term "visual literacy".

That teachers need to have considerable knowledge and skills in visual communication is supported by a large body of literature, which is detailed in the next section of this paper. A search of several databases, including ERIC, PSYCHLIT and Dissertation Abstracts, was conducted initially using a variety of descriptors, including "visual literacy" and "teacher education". This search unearthed a wide range of skills considered to be critical to good teaching and learning, but only a few articles even specifically mentioned that teachers might need special training to implement the suggestions. And of the few articles that acknowledged the need for teacher training, there were generally two approaches. One approach was that the authors dismissed the issue with broad statements to the effect that yes, teachers need to be trained, without looking at the deeper question of where and how that should be done. A second approach was to suggest methods (some very specific) for training practicing teachers through in-service workshops.

Additional evidence for the absence of teacher training as a topic in the visual literacy literature comes from Walker (1992). Walker, in trying to organize the diverse concepts included under the umbrella term of visual literacy, did so in two ways. First, she listed the structure of the table of contents from IVLA books of readings from 1982 to 1991. She further illustrated that information with a concept map. Nowhere in Walker's summary of topics was there any reference to teacher training, although there were numerous references to education, including the following descriptors: visualization in education, enhancing human potential through education, schooling, curriculum and instruction, visual literacy and education, and schools and curriculum.

On the possibility that visual literacy might be more of a practical reality than the subject of academic articles, an informal survey was conducted of college catalogs for institutions of higher education nation wide. A random sampling from 16 states and 21 institutions with teacher training programs revealed that none had a specific course in visual literacy listed in their undergraduate or certification offerings. Although most of the institutions had some requirement for art (primarily in elementary education), only one institution offered a course directly related to visual literacy: visual thinking and visual images. This course was not a requirement, but was a possible elective for prospective teachers.

The issue of where or when such training should occur was not one we chose to address in this pilot study. It was the general belief of the authors that the only way to systematically guarantee the addressing of visual literacy training for teachers is at the pre-service level, which is generally the baccalaureate level. From this research, it appears that alternative training approaches may be due some consideration, and some discussion of that question is provided in the last section of this paper.

Two things seemed apparent to us in our initial investigation. First, the number and variety of references to visual literacy in education clearly established that teachers should have these skills. Second, the lack of information about how teachers were being trained or should be trained indicated that more research was needed. In order to gather more systematic information about the status of visual literacy in training programs for prospective teachers, the following study was designed and implemented.

As a starting point it was decided to conduct a pilot study in which we would survey instructional technology faculty at a number of institutions around the country. We selected instructional technology faculty because we felt they were the most likely to have an understanding of visual literacy as a field and thus able to evaluate the status of their programs. The content of the survey was to address the current state of each institution's programs in relation to five basic questions:

1. what, if anything, is being taught about visual literacy in your teacher education programs?
2. in what course or context are visual literacy concepts being taught?
3. what is the best delivery format for visual literacy instruction?
4. what content related to visual literacy is most important for prospective teachers to know?
5. what is the awareness level of your students and faculty about visual literacy?

Review of the Literature

Much has been written about the historical difficulty of defining visual literacy as a field and thus as a recognized movement. Seels (in Moore and Dwyer, 1994), acknowledges this challenge:

> It wasn't until the 1950's and 1960's , when television seemed to be influencing behavior and knowledge, that the concept of visual literacy caught the attention of educators. This interest was dispersed among leaders in many areas of education. As a movement, visual literacy has had relatively little impact on schools because, as with any new field, it has been building a theoretical and political base (p. 97).

Some would argue that the ability to communicate visually is a natural thing. Seels make a case for the necessity for visual literacy training in general. She quotes Hewes (1978) on the development of visual systems in our culture. "Hewes grants that people of normal vision who experience the concrete world develop similar visual abilities, but he argues that this fact does not make visual literacy superfluous. The "visual literacy is a general human condition" position is not sufficient because there are cross-cultural and technological phenomena to be taken into account." (p. 99)

Seels, further quoting Hewes, points out the effects of technology on increasing our need for visual literacy skills, and how visual literacy skills are not to be equated to verbal skills.

> ...for most of us, our visual outputs are not naturally comparable to

> our reading and writing skills because we do not have artistic or drawing talent. This equation changes with the development of photography because photography empowers people visually. With computer graphics, digitized photography, and interactive video, we have tools that raise the ability to visualize to new planes. Using today's technology, researchers can electronically unwrap 3,000-year old mummies, and consumers can turn their *Macs* and *PCs* into electronic darkrooms using photo CD images." (p. 99.)

A wide body of literature addresses the many applications of visual literacy skills and knowledge in improving the teaching and learning process. Examples of the wide range of applications include knowledge mapping as a learning strategy (McCagg and Dansereau, 1991), diagrams as a way of illustrating sequential and hierarchical relationships in social science texts (Guri-Rozenblit, 1988), designing visual analogies for instruction (Smith, P. and Ragan, T., 1992), and design and evaluation of text illustrations (Duchastel, P. and Waller, R., 1979; Holliday, W., 1990).

Suhor and Little (1988) present a "general model for a semiotic theory...as a way of depicting relationships among not only linguistic signs and visual signs, but other signs and sign systems in educational contexts." (p. 469). Sinatra (1986) extensively discusses the relationship of visual literacy to the reading and writing process. Clarke (1991) argues for the use of visual organizers such as time lines, Venn diagrams, inductive towers, concepts maps, causal chains, force fields, and flow charts in teaching reading across all subject areas.

Media literacy is another area of visual literacy which could be of potentially strong impact on young learners. Buckle and Kelley (1990) developed a program they designed to increase comprehension of television viewing of 12-13 year olds. The link between visual literacy and computers has been described by many writers, including using the visual capacity of computers as a tool for teaching visual skills (Ragan & Rezabek, 1987).

Most recently, Moore and Dwyer (1994) in their comprehensive new book *Visual Literacy: A Spectrum of Visual Learning*, brought together a number of contributors who discussed the many aspects of visual literacy in detail. Of these many contributors, Fredette's chapter on Use of Visuals in schools (Curriculum and Instruction) comes closest to addressing the issue of what prospective teachers should know. Indeed, the chapter, and the book as a whole would make an excellent textbook for a visual literacy course. However, Fredette, like all other sources we reviewed, concentrates on the content of visual literacy rather than the training required to teach the implementation of visual literacy in the public school classroom.

This leaves us with an interesting question. If such a clear case for accessing and developing visual skills in the teaching-learning process has been established, where and how are teachers expected to acquire these skills and knowledge? One might logically argue that if we assume teachers come equipped with such skills and knowledge, why would we then assume students do not?

The result of the review of the literature was to reinforce the notion that:

a) prospective teachers need training in the skills and knowledge related to visual literacy if they are to develop such skills and knowledge in their students.

b) inferring from the lack of data and from personal experience, the conclusion can be drawn that visual literacy is not a common topic of conversation at the level of teacher training.

Methodology

This project was envisioned as a pilot study. Since no specific information was available concerning the prevalence of visual literacy as a topic addressed in teacher training, we determined to begin an investigation of this topic by surveying a number of colleagues, professors in the field of instructional technology. An initial list of contacts based on personal connections was compiled. Also, in some cases, respondents were asked for further possible contacts. The goal was not to conduct an inclusive survey of all teacher training programs, but to gather a clearer picture of the status of visual literacy in teacher training programs, in order to determine what further study might be called for.

The Survey instrument was developed to provide information for the research and clarification of specific research questions. A starting place was a column in the *Visual Literacy Review*, April 1994, titled "The Short Form", Visual Literacy in General Education: Definition. This article offered a definition of three specific abilities associated with visual literacy, specifically as visual literacy may impact higher education activities. The three abilities were given were: to visualize internally, to create visual images, and to read visual images.

Using these categories as a base, we translated the three categories in terms of instructional activities, based on a broad list of topics generated in our search of the ERIC database. The purpose was to define more specifically visual literacy skills and knowledge in terms of what teachers need to know or be able to do to integrate visual literacy into their teaching, in order to im-

- **Visual perception and visual learning processes**
  (visual thinking, visualization, perceptual theories such as dual coding, visual symbolism, and visual learning styles)
- **Creating visual images**
  (design and production of visual materials in a variety of media, proper use of visual communication elements)
- **Evaluation of visual messages**
  (informed interpretation of visual media, including mass media, proper selection and use of ready-made visual instructional materials)

Figure One: Categories of instructional activities for visual literacy prove the teaching / learning process. We also wanted to express visual literacy concepts in language that avoided jargon. Therefore, under each category heading, several examples of instructionally related activities or concepts were listed to illustrate and clarify the main point. See Figure One.

We also determined to create an instrument which would give us the information we were looking for without overburdening the respondents. The goal was to survey a relatively small number of people but to have a high response rate. As a further way of ensuring a high response rate, it was decided to conduct the survey by telephone. A copy of the survey form is included at the end of this paper.

The surveys were conducted over a period of three weeks. Each of the authors did one initial survey as a formative evaluation to determine any changes or clarification which might be needed. The only changes made after this initial testing were format changes to make the response choices clearer to record. A total of eight surveys were conducted in this pilot study.

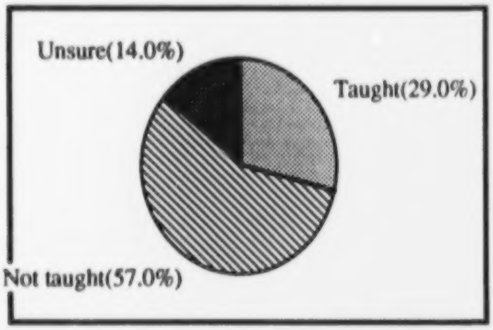

Figure Two: Responses to query regarding teaching of visual literacy in teacher education program.

Results

Figure Two shows the respondents' overall perceptions regarding the presence of visual literacy as a concept within programs of teacher education. Survey responses indicated that visual literacy is addressed as a concept in only 29% of the institutions. Figure Three reflects respondents' opinions of the ways in which visual literacy is being addressed. In 14% of the institutions, visual literacy is offered as a specific course. In 86% of the institutions, visual literacy was seen as integrated, to a greater or lesser extent, into the content of other education courses, particularly in methods or materials development courses.

On the question of what should be included in a visual literacy curriculum (see Figure One), all three categories were deemed important. Average responses were over 4.0 on a five-point scale for all three categories.

Respondents were unanimous in their opinions of the most appropriate form for

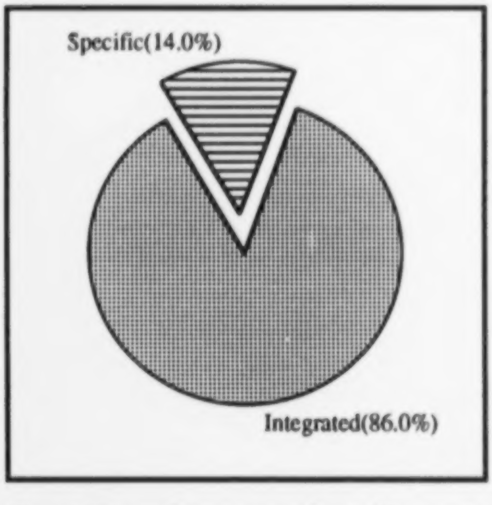

Figure Three: Occurence of specific course vs. integrated approach.

offering visual literacy content within teacher education programs. Every respondent rated integration into instructional technology courses as the best approach. Overall, the second choice was integrating visual literacy content into other teaching methods courses, and the final choice was to create a specific course. Regarding the phrase, "instructional technology courses", several respondents pointed out that instructional technology courses are sometimes viewed as being only for computer literacy, but the intention of the question refers to courses which address a wide range of technology related instructional skills and knowledge.

It was the respondents' opinion that the general awareness level about the need for visual literacy was low. On a scale of 1-5, with one being no awareness and five being high awareness, respondents marked both faculty and students at just over 2.

In order to determine whether our original assumption about the link between instructional technology and visual literacy was accurate, we also asked respondents to rate the degree to which visual literacy was emphasized in their own training. No conclusive pattern was found. On a scale of 1-5, with one being not at all, and five being highly emphasized, the average response was 3.0. The responses ranged from one to five.

Conclusions / Recommendations

Our initial findings indicate that visual literacy as a specific content area is not valued or specifically included in teacher training programs, although it may be integrated in other ways, under other guises. Survey respondents rated visual literacy very high, and felt all aspects of visual literacy were of equal and high importance for preparing teachers to be effective in the classroom. Respondents also indicated a disappointingly low level of awareness among faculty and students about the importance of visual literacy as a subject of study.

Open ended responses indicate a possible problem in the operational definitions of visual literacy and instructional technology by people outside those fields. A difficulty in perceiving broader concepts than computer skills and bulletin boards limits study and development of more important visually-related communications skills.

Obviously, more study is needed to determine if the patterns we have identified are generalizable to teacher preparation nation wide. Continued research will follow this pilot, but other research from other perspectives can also illuminate the issues. For example, in-service and graduate programs may contain visual literacy study. If such programs exist, are they effective and do they represent the most appropriate place to deliver visual literacy concepts?

On a practical level, for those who work in institutions that offer teacher training, look for ways to introduce the terminology of visual literacy as a means of connecting to what other faculty may be doing. Since integration into methods courses seems to be one possible avenue for delivering visual literacy concepts, each of us needs to assist in the development of this integration, particularly in activities such as production of instructional materials and media. A strong argument for the integration approach comes from evidence provided by our respondents. State certification requirements for teacher training programs leave little room for new curricular offerings, and have even resulted recently in the deletion of visual literacy related courses such as media design and even computer literacy in some institutions.

Those interested in the field of visual literacy, and certainly all members of IVLA, are well aware of the challenges we continue to face in making others aware of first, the concepts of visual literacy and second, the terminology of visual literacy. Change as a process must begin with awareness. Once people understand that visual communication and visual messages dominate our lives, they soon come to realize that such a powerful mode of communication should not be left to chance, nor should it be reasonably assumed that all people come naturally equipped with the kind of visual communication skills which are necessary for functioning in today's world. Just as public education teachers are routinely required to have training in public speaking, so their ability to communicate visually should be honed through training.

And just as in so many other areas of our society, changes will not come about without the work of strong advocates. Our future actions can be shaped partly through the results of this study: we cannot take for granted that people either understand or practice these things we recognize to be important. Education of teachers in visual literacy must begin in programs of education. Education of our colleagues in teacher education programs must begin with us.

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Visual Literacy and Multimedia Presentations

Joyce Kupsh

The "M" word of today is multimedia–a word meaning many different things to different people. *Webster's Ninth New Collegiate Dictionary* shows the word multimedia to be an adjective meaning using, involving, or encompassing several media. This paper is using multimedia as an adjective with the noun presentations.

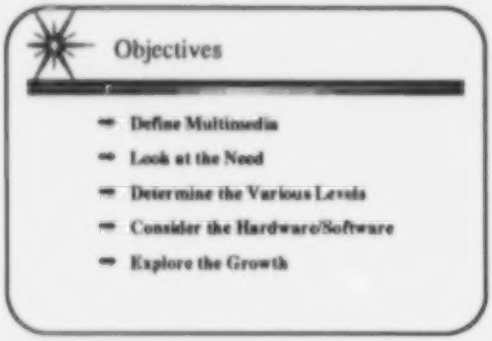
Multi refers to more than one, and media is a means of expressing or communicating. Thus, multimedia presentations can be defined as *the integration, control, and manipulation of text, art and graphics, photography, animation, audio, and video for presentations.*

> "Multimedia is the integration, control, and manipulation of text, art and graphics, photography, animation, audio, and video for presentations."

The first section includes an overview of multimedia presentations. The second section takes a look at how multimedia is being implemented through the Multimedia Design Center at California State Polytechnic University, Pomona.

Multimedia Presentations
Overview

This overview of multimedia presentations contains a look at the need for media, the various levels of multimedia presentations, the hardware/software requirements, and the growth of multimedia presentations.



Objectives

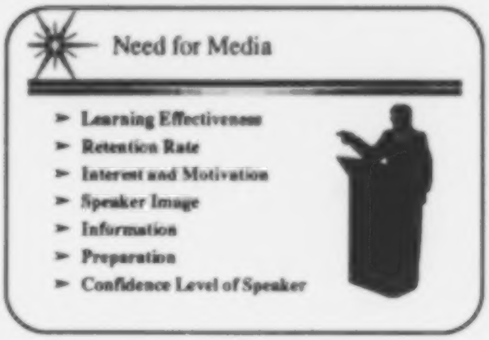
- Define Multimedia
- Look at the Need
- Determine the Various Levels
- Consider the Hardware/Software
- Explore the Growth

Need for Media

Great orators, comedians, and entertainers are able to hold the interest of an audience without the use of media. However, most individuals making a presentation to a group find that the use of media is essential for truly successful meetings, conferences, seminars, conventions, training sessions, or classroom lectures.

Both the audience and the presenter benefit from the use of presentation media. Advantages of using media include:

- Learning effectiveness is improved.
- A higher retention rate occurs.
- More interest and motivation are created.
- The image of the speaker is enhanced.
- More information can be effectively covered.
- Better preparation results from the advanced effort required.
- The confidence level of the speaker is increased by reducing the nervousness of having to memorize the presentation.

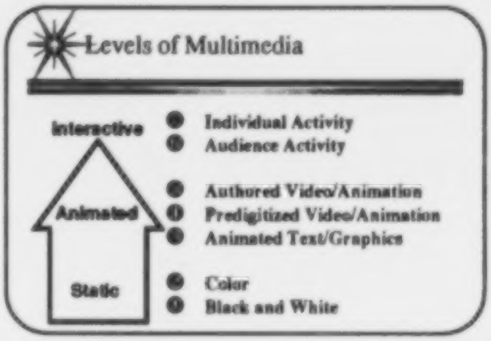


Need for Media

- ➢ Learning Effectiveness
- ➢ Retention Rate
- ➢ Interest and Motivation
- ➢ Speaker Image
- ➢ Information
- ➢ Preparation
- ➢ Confidence Level of Speaker

Levels of Multimedia Presentations

The distinction between presentations and multimedia sometimes becomes a bit blurred. Presentations can be categorized as static, animated, and interactive.



Levels of Multimedia

Interactive
- ● Individual Activity
- ● Audience Activity

Animated
- ● Authored Video/Animation
- ● Predigitized Video/Animation
- ● Animated Text/Graphics

Static
- ● Color
- ● Black and White

Static. Visuals used in static presentations may be either in color or black and white. They may include graphics as well as text. But as the word static indicates, these visuals contain no motion or movement of any kind. A desktop presentation software program makes the preparation task much easier.

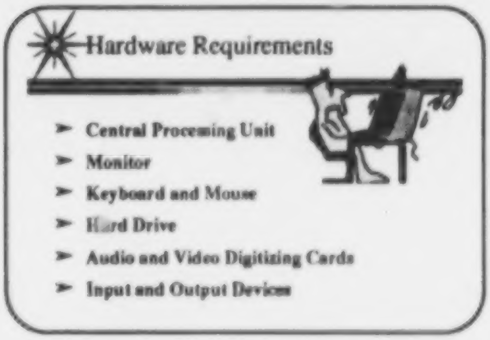
Animated. By adding animated text and/or graphics to static visuals, the visuals become more stimulating and exciting. Text builds and transitional effects between visuals are possible through the use of special features available in most desktop presentation packages. The addition of predigitzed video and animation is an even more sophisticated technique for bringing motion into the presentation. Personally designed video and animation can also be used.

Interactive. Interactive presentations are possible with a non-linear approach. The viewers (either as a group or on an individual basis) respond by using a mouse or a touch screen. This response determines which sequence is addressed next.

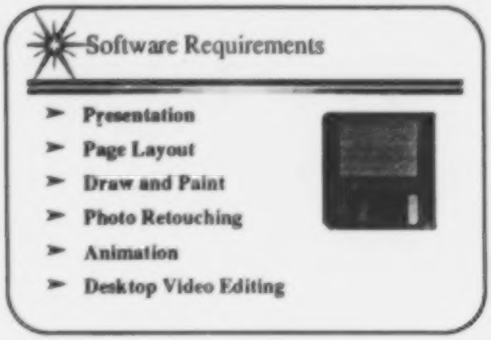
Hardware/Software

The specific hardware and software needs grow as the level of sophistication increases. The basic needs for developing multimedia presentations are as follows.

Hardware. In developing multimedia presentations, a user will need a central processing unit, a monitor, a keyboard and mouse, a high capacity hard drive, audio and video digitizing cards, and input and output devices.


Hardware Requirements

- Central Processing Unit
- Monitor
- Keyboard and Mouse
- Hard Drive
- Audio and Video Digitizing Cards
- Input and Output Devices


Software Requirements

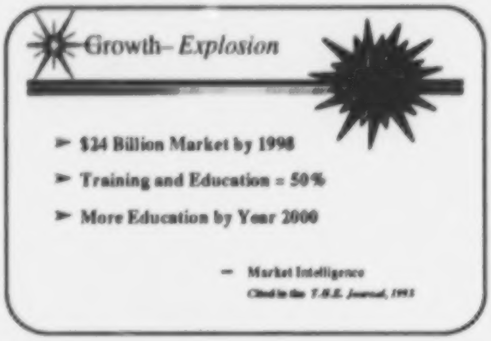
- Presentation
- Page Layout
- Draw and Paint
- Photo Retouching
- Animation
- Desktop Video Editing

Software. In addition to presentation software, multimedia developers will also need additional types of programs such as page layout, draw and paint, photo retouching, animation, and desktop video editing.

Growth of Multimedia Presentations

Multimedia presentations are growing at a rapid pace as illustrated by the following facts.

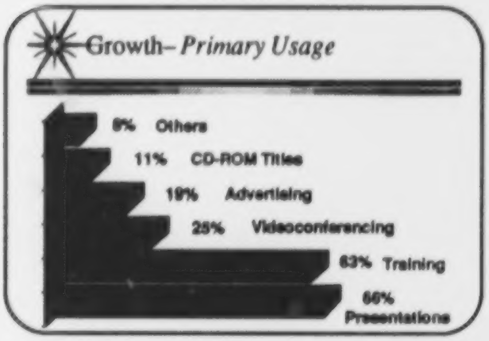
- A recent study completed by Market Intelligence cited in the *T.H.E. Journal* (1993, p. 4) states that the worldwide multimedia marketplace is on the brink of a seven-year explosion and is expected to peak at $24 billion in 1998. They credit education and training as accounting for over 50 percent of the total $24 billion market, with education overtaking training by the end of the decade.


Growth– *Explosion*

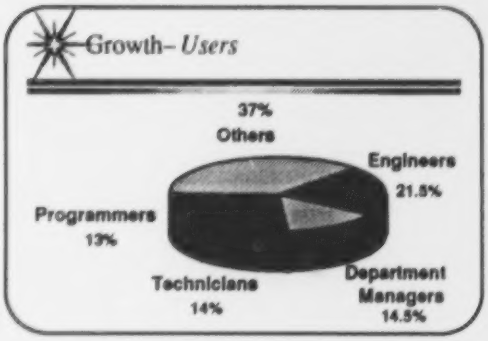
- $24 Billion Market by 1998
- Training and Education = 50%
- More Education by Year 2000

– Market Intelligence
Cited in the T.H.E. Journal, 1993

- *New Media* (1994, p. 55) reports a study by Dataquest of 200 large corporations concluding that the primary uses of multimedia are presentations and training. The responses of the primary use of multimedia are 66 percent responding presentations, 63 percent saying training, 25 percent listing videoconferencing, 19 percent showing advertising, and 11 percent identifying CD-ROM titles, and 8 percent stating other uses.


Growth– *Primary Usage*

- Dataquest's survey (*New Media*, 1994, p. 53) of corporate multimedia users also showed that engineers were more likely to use multimedia than other types of professionals. The responses were engineers (21.5%), department managers (14.5%), technicians (14%), programmers (13%), project managers and designers/producers (each 7.5%), MIS managers, (5.5%), managers (5%), specialists (4%), consultants (3%), scientists, (2.5%), educators and owners (each 1%).


Growth– *Users*

- The Dataquest study (*New Media*, p. 50) showed that of the 200 companies who reported using multimedia, manufacturing-oriented businesses were the largest segment. The complete results were manufacturing–discrete (25%), transportation/utility (12%), aerospace (11.5%), finance/insurance/real estate (11%), manufacturing–process (9%), medical and legal (8%), other services (7.5%), research and development (7%), architecture/engineering (5%), and consulting (4%).

Growth– *Types of Business*

Manufacturing–Discrete
Transportation/Utility
Aerospace
Finance/Insurance/Real Estate
Manufacturing–Process
Medical and Legal
Other Services

Implementation of Multimedia at Cal Poly

California State Polytechnic University at Pomona recognized the need for multimedia presentations and began moving in this direction in 1989. This section provides a discussion on centralization versus decentralization, the development of three labs, financing and staffing issues, and a look at the curriculum.

Centralization

The costly impact of multimedia technology can be abated through the centralization of computer workstations and peripherals–such as specialized software, clip art, CD–ROMs and drives, large high-resolution monitors, color scanners, color printers, film recorders, etc.

Centralization was popular when data processing and eventually word processing first arrived. However, decentralization of word processing began to take place as popularity of the equipment increased, promoting convenience and greater productivity. A return to centralization for high-end multimedia production has many advantages including the sharing of expensive and specialized hardware and peripherals. In addition, skilled and knowledgeable assistance is more feasible.

Development

In 1990, Cal Poly started a Presentation Design Center (later renamed Multimedia Design Center) with a $12,000 California Lottery Grant and $46,000 worth of equipment donated by Apple Computer. This facility has expanded and relocated three times in the last four years and is now housed in the new CLA (Classroom/Laboratory/Administration) building on campus.

Multimedia Design Center (MDC). The MDC is a 20-station facility providing high-end workstations dedicated to enhancing the development of presentations for students, faculty, and staff from throughout the university community. The center is open between 50 and 60 hours a week with skilled consultants and assistants available to assist users in designing their oral, written, or multimedia presentations. The consultants are paid student workers; the assistants receive units of credit for working in the MDC.

Multimedia Learning Lab (MLL). The MLL consists of 25 high-end multimedia workstations arranged in traditional classroom style. More than 30 different three-hour hands-on workshops and seminars are held each quarter.

Fee charges are as follows: $25 for Cal Poly staff/students, $30 for educators, and $50 for people from business/industry. Personalized workshops can also be scheduled to fit the special needs of a group. In addition, faculty can schedule to use the lab when hands-on instruction is needed for their classes.

Syntonic Lab. The Syntonic *(a word meaning awareness and sensitivity to the environment)* Lab is a third lab presently under development. This lab will have a flexible design so that it can be used either as a Design Center or a Learning Lab for preproduction activities such as group brainstorming and production planning.

Financing and Staffing Issues

The financing of the original Presentation Design Center came from donations from business with a modest supplement from the College of Business Administration. Expansion and growth funds resulted from a special grant from the University President's Cabinet for $125,000. Another $686,000 resulted from being in the right place at the right time. Because the CLA Building was new, proposals were requested for 16 (out of a total of 25) computer labs.

Funds for support staff have been the hardest to obtain. Economic hard times and cutbacks make the hiring of new full-time permanent employees impossible. Therefore, funds for student help are currently obtained from the special grant from the University President but are also solicited from the various colleges. The fees charged for the workshops and a small profit gained from selling supplies are channeled into a fund to pay graduate and student assistants. Donations from former users who are now alumni will be sought in the future.

Curriculum

Presently, two new courses at Cal Poly directly address the subject of presentations. The first class is a graduate class titled ***Professional Presentations Using Technology.*** Another course titled ***Design and Presentation of Information*** is offered on the undergraduate level. Even though the classes are electives at the present time, the enrollment is strong because students realize the usefulness as well as the necessity of such courses.

A suggested topic outline for a course on presentations is taken from the book *How to Create High Impact Business Presentations* (Kupsh, 1993) includes:

- Creating Effective Presentations
- Planning the Strategy
- Selecting the Media
- Developing the Message
- Using Diagrams and Graphs
- Designing Visuals
- Working with Color
- Considering the Environment
- Being a First-Rate Presenter
- Conducting Meetings
- Delivering and Evaluating
- Moving into Multimedia

Opportunities

Many other computer labs are available on the Cal Poly campus, provided by the university and the various colleges. However, the MDC and the MLL have become popular spots on campus for the following reasons. The MDC and the MLL have:

- Advanced the quality of presentations throughout the university.
- Shared resources making more sophisticated multimedia equipment available than might have otherwise been possible.
- Provided a large number of open hours enabling maximum use of resources–hardware/software as well as support help.
- Provided training assistance to reduce the frustration level of beginning and even experienced users.
- Improved the images of students, faculty, and the university when they are making presentations.

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Applying Principles of Visual Literacy to the Design of Distance Education Materials for Correctional Use

James S. Lenze

This paper concerns the application of visual literacy principles in the design of a distance learning project. Specifically, this paper will examine the conceptualization and design of the Pennsylvania Audiographics Distance Education Project's (PADEP) Life Skills and Drug Education course. Additionally, this paper will discuss the successes and difficulties of the project based on results from formative evaluation.

The Conceptualization

In September, 1993, a group of educators met near Harrisburg, Pennsylvania to discuss the development of new courses that could be delivered using teleteaching technologies. The group had previously agreed to use a specific teleteaching system known as teleteaching audiographics.

The Equipment and Set-up

The selected audiographics system, as illustrated in figure one, can include two or more sites that are equipped with a personal computer (DOS platform) and 9600 baud modem, a speaker phone, an audiographics software application, and two phone lines.

This equipment allows for the creation of an audiographic network. This particular type of network requires that each site be equipped with two, voice-grade telephone lines: one dedicated to voice transmission through a speaker phone and the other linking the personal computers by modem.

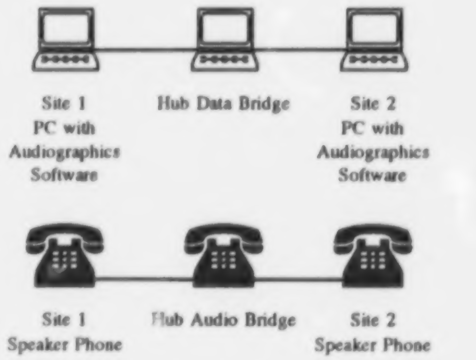


Figure One:
The basic set-up for the audiographics teleteaching network used by the Pennsylvania Audiographics Distance Education Project. Each site has one personal computer with 9600 baud modem, one speaker phone, audiographics application software, and two phone lines.

The audiographics software application, used by the PADEP, can be run on a 286 machine. A Windows version of the software does not exist. The computers are equipped with 14" VGA monitors and 9600 baud modems. The audiographics software provides the interaction between sites.

Audio and data bridges are located at a central site through which all audio and data transmissions are received and sent to each site simultaneously. The hub selected for this project is capable of supporting 8 simultaneous users.

With this particular software application, each lesson takes the form of a slide show. Each slide is saved as a separate file on a disk. Slides can then be organized to be delivered linearly or non-linearly.

Once connections are made, each site can see and interact with the same slides at the same time. Voice interaction is also possible through the speaker phones.

Youth Correctional Facilities

The adoption of this system stemmed from a need to address the specific learning needs of troubled youth. The group of Pennsylvania educators discussed the concern that youth oriented correctional agencies across the country are struggling to meet educational needs despite dwindling resources. Often these correctional agencies identify an educational need which would benefit only a few clients or even one individual. Meeting the needs of a few hampers the efforts to meet more general requirements of other clients.

More commonly, schools identify educational needs with sufficient numbers of potential learners and develop and integrate specialized courses into their curriculums to meet those needs. As a result, many schools meet one specialized need and are forced to ignore the rest.

The group of Pennsylvania educators agreed that audiographic distance education would enable correctional and mainstream schools to economically share their resources so that educational needs are more efficiently and effectively met.

A representative from one the youth correctional facilities announced that his organization would develop a 40-day audiographic instructional unit on life skills and drug education. The course would be offered to other schools which were represented in the group.

The Design of the Project

Taking a Visual Approach

This author was selected as the principal investigator and instructional designer for the project. It was determined that, due to the visual nature of the medium, the instructional design would be based on relevant research in the field of visual literacy.

By its very nature, audiographics distance education is a highly visual technology. Research has shown that many learners are visually oriented and that such individuals benefit more from visually oriented learning strategies (Dwyer, 1972; Lesgold, McCormick, and Goinkoff, 1975; Carnine and Kinder, 1985).

Defining visual literacy is a difficult task that results in more disagreement than consensus (Herring, 1980; Seels, 1994). However, the concept can be narrowed into three constructs which allow for a more tangible approach (Randhawa, 1978; Seels, 1994). Randhawa identifies these three constructs as visual thinking, visual learning, and visual communication. The design of the Life Skills and Drug Education course centered around these three constructs.

Visual thinking refers to the mental imagery of visual concepts (Seels, 1994) and strongly relates to the internal mediational processes which each learner brings to the analysis of visual stimuli (Lenze and Dwyer, 1993). The argument can be made that visual learning cannot take place until visual thinking has been initiated by the learner.

Visual learning refers to learning from visuals and the design of visuals for instruction (Seels, 1994). This concept relates to much of the research dealing with imagery.

Paivio's (1979) concept of visual imagery relates memorability to concreteness. Concepts which are more concrete in nature, like "tree", are more easily visualized mentally and more easily remembered than more abstract concepts like "discretion."

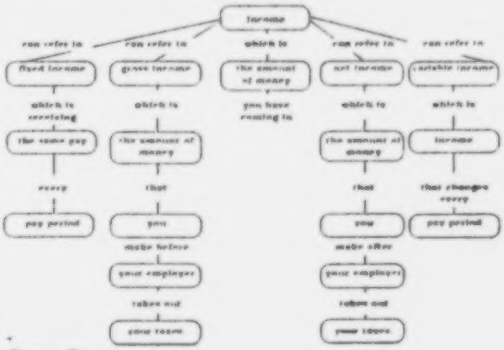
According to Paivio's (1979) theory, once concrete images are established within the learner's memory, they will act as hooks on which other ideas are connected. This is what Gambrell and Bales (1986) refer to as associative learning, and it forms the basis for a learning theory known as concept mapping. *Concept mapping* will be discussed later in this paper as an instructional strategy.

Visual communication is the last construct. It refers to the expression of the ideas through visual means (Seels, 1994). How well these ideas are communicated and received involves the interaction of visual thinking and learning. This is the heart of visual literacy.

Since audiographics is limited in what it can express verbally, emphasis has been placed on visual communication. The speaker phone is the only means of oral communication. Such communications can be confusing without a sufficient visual reference. Because of this, the computer screen and print materials became very important to the design of the Life Skills and Drug Education course. It was decided that both the screen design and the workbook design would be visual in nature. Ideas would be communicated visually whenever possible. It is hoped that by emphasizing visual communication strategies, visual learning will occur and facilitate visual thinking. Of course the ultimate hope is that the instruction would succeed and the learners would come to understand basic life skills and the dangers of illegal drug use.

Concept Mapping

Concept mapping is an instructional strategy that relies on the idea that in order for learners to grasp concepts, those concepts must first become integrated into existing memory (Ault, 1985). Since concepts which are more concrete are easier to integrate, instruction must begin by presenting the learners with concrete images and concepts.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takes out
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Figure Two:
An example of a concept map.

Once these concrete concepts are established in the learner's memory, additional concepts can be attached, or mapped onto the new concrete concepts. The result is a series of concepts which are mapped together on an outward flowing continuum of concrete to abstract concepts and which are successfully integrated into pre-existing memory (Ault, 1985).

One of the first lessons in the course

is centered around concept mapping. In this lesson learners are taught to identify the important concepts from a short instructional text. They then write these concepts on a piece of paper. They are then told to draw a line between any of the concepts which are related in any way. On these lines they write the relationship. When finished they have a map of concepts which provide them with a visual form of the ideas. A sample concept map is show in figure two.

Generative Learning Strategies

In addition to concept mapping, a visual instructional strategy was selected. This strategy is based on generative learning techniques (Wittrock, 1974, 1978, 1981, 1990; Wittrock and Carter, 1975).

Generative learning is a process oriented cognitive processing model in which the learner generates relations "(1) between the text and the learner's knowledge and memories and experience, and (2) among the units of the text, such as words, sentences, and paragraphs" (Peled and Wittrock, 1990), p. 175). The basic premise of generative learning is that learners will more easily recall images and concepts that they themselves generate as opposed to images and concepts generated by the instructor or instructional text.

In the Life Skills and Drug Education course, students are presented with a visual representation of a concept. They are told to imagine that concept in their head and then copy it onto a diagram in their workbook. Gradually, students copy additional visuals into their workbook until the total image is complete. Figures three through seven show the progression of such an activity involving the parts of the brain.

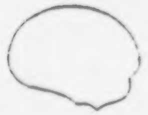

Figure Three:
Outline of brain as seen in learner's workbook.

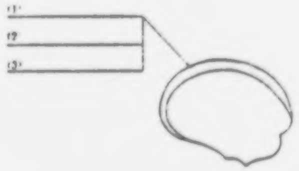

Figure Four:
Second outline of brain as seen on the computer screen. The outer layer is drawn in and learners are asked to copy it onto their diagrams.

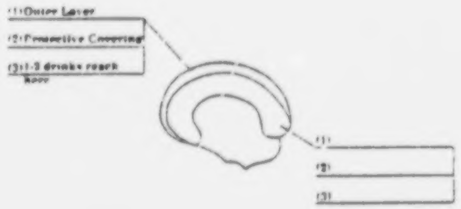

Figure Five:
Third outline of brain as seen on the computer screen. The cerebrum is drawn in and learners are asked to copy it onto their diagrams.

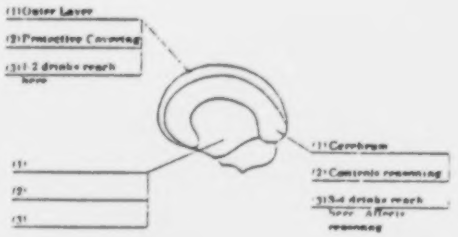

Figure Six:
Fourth outline of brain as seen on the computer screen. The middle brain is drawn in and students are asked to copy it onto their diagrams.

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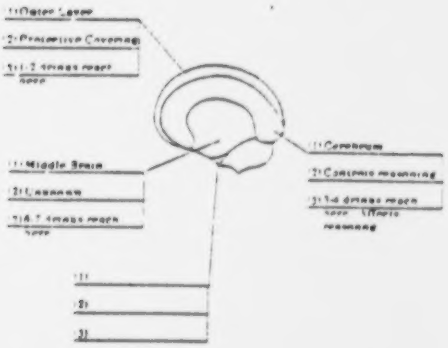
(1) Outer Layer
(2) Protective Covering
(3) 1-2 drinks reach here
(1) Middle Brain
(2) Unknown
(3) 6-7 drinks reach here
(1) Cerebrum
(2) Complex reasoning
(3) 3-4 drinks reach here affects reasoning
(1)
(2)
(3)

Figure Seven:
Fifth outline of brain as seen on the computer screen. The medulla is drawn in and learners are asked to copy it onto their diagrams.

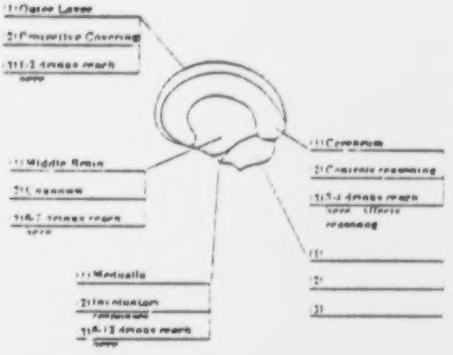
(1) Outer Layer
(2) Protective Covering
(3) 1-2 drinks reach here
(1) Middle Brain
(2) Unknown
(3) 6-7 drinks reach here
(1) Cerebrum
(2) Complex reasoning
(3) 3-4 drinks reach here affects reasoning
(1) Medulla
(2) Involuntary functions
(3) 8-12 drinks reach here
(1)
(2)
(3)

Figure Seven:
Sixth outline of brain as seen on the computer screen. The cerebellum is drawn in and learners are asked to copy it onto their diagrams.

Notice that each diagram is connected to three blank lines. On the first line students label the particular part of the brain. On the second line learners write in the function of that part, and on the third line they write in the number of drinks an average individual would need to consume to affect that part of the brain.

Additional Visual Design Strategies

Visual design strategies were not limited to the design of instructional activities. The screen design of the slides and the layout of the workbook were also created with visual literacy in mind.

Lenze (1992) states that there is a cognitive rationale for structuring text. This rationale is based on mathemagenic and parsing theories (Baddaley, 1986; Gagne', Briggs, & Wager, 1988; Rothkopf, 1966, 1970; Stine, 1990). Such structuring guides the learner through the text and separates information into meaningful and related parts.

Most notably, text accents have been inserted into the text to cue learners to important words and phrases. Important words are listed in italics. Any word in italics can be looked up in the glossary of the workbook. Important phrases, such as those which need to be recalled for quizzes, are in bold text. In the course, learners are provided with early instruction as to what these accents signify and how to use them to learn from the text.

Finally, visuals are included in the workbook and slides whenever possible. Research has shown that the use of visuals in instruction is very beneficial when appropriately used (Dwyer, 1978; Pettersson, 1989).

Successes and Failures

Although this project is still in the formative stages, some interesting information has already been learned.

The software application, which is used in this project, was not selected by this author and should have been rejected as antiquated before the project began. There are several major problems with the package including:

- A primitive graphics capability.
- The ability to work with only one out-

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dated model of scanner.

- Limited selection of fonts.
- Poor legibility.
- Awkward user interface.
- Expensive.

Additionally, it was originally hoped that the workbook could be designed with the help of the course instructor. The course was developed from the work of a teacher at the correctional facility. That teacher, however, resigned her position at the school during the development of the project. Her replacement held the position for a short time and was then transferred to another position. His replacement was enthusiastic about the project but due to his late arrival he was not able to provide much to the project in the way of design.

There is some good news. A few of the lessons have been subjected to formative evaluation and have proven to be quite effective. Learners adopted the instructional techniques and appreciated the extra structure and the ability to interact with a computer.

One of the strengths of visual literacy research is that so much of it is having an impact on actual instruction. It is hoped that visual literacy will have as great an impact in the area of distance education as it has in so many other fields of study.

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Visual Literacy and Visual Culture

Paul Messaris

Anyone who has read *Mad* magazine has encountered the image of Alfred E. Neuman, whose insouciant features have appeared on so many of the magazine's covers. In 1963, a resident of Auckland, New Zealand, pasted a picture of young Alfred's face on a plain envelope and, with no other indication of the envelope's destination, he dropped it in a local mailbox. His letter was duly delivered to the office of *Mad's* publisher in New York City (Reidenbach, 1991, p. 138).

This incident is a striking example of the broad reach of U.S. visual culture (a phenomenon that some observers have viewed with considerable concern; see Tomlinson, 1991). A study by Dumas (1988) provides a revealing counterexample. As part of a broader investigation of viewers' interpretations of advertising images, Dumas showed Chinese and U.S.-born graduate students a picture of a man in a business suit having breakfast next to a window with a penthouse-level view of a big city. This picture had come from a print ad for a prestigious financial-services firm, but the firm's name and all other text had been removed. The image of a man looking down at a city or a factory from a tall building is a traditional device in U.S. advertising (Marchand, 1985), and Dumas's U.S.-born respondents readily identified the image's implications of wealth and power. However, these implications were much less obvious to the Chinese respondents, many of whose comments focused instead on the reasons why a middle-aged man would be having breakfast alone, without his family.

In opposite ways, both of these examples demonstrate the potential consequences of an intriguing aspect of visual literacy, involving familiarity with specific images or sets of images that have played a role in a particular culture's visual heritage (or, as in the case of *Mad* magazine, a visual heritage that spans many nations and cultures). One way to approach this kind of visual literacy is to ask a pair of practical questions: Is this a type of knowledge that is worth building into the formal educational curriculum of our schools? What are the educational implications of visual literacy in this sense of the word? These are the concerns that motivated the present discussion.

Educational Rationale

Advertising Awareness

There are at least three reasons why one might want to say yes to the first question posed above. To begin with, there is the possibility that knowing about the conventional implications of certain images might make viewers more resistant to the manipulative uses of those images in advertisements or other contexts. As Dumas's study suggests, educated viewers often find it relatively easy to identify the intentions behind the persuasive images of their own culture. On the other hand, however, there is some evidence that less-educated viewers may be less-conscious of these intentions and may therefore be in a position to benefit from instruction on such matters (Messaris, 1994).

Historical Knowledge

A second reason for encouraging the form of visual literacy being considered here has to do with a rather different category of images, namely, those with a notable historical content. More specifically, it could be argued that certain images, primarily photographs, have been so intimately and significantly intertwined with the social developments from which they emerged that the teaching of history seems almost inconceivable without some reference to these images.

The civil rights marcher being attacked by police dogs; the exhausted woman seeking refuge in a camp for Depression-era migrants; the Vietnamese children fleeing a napalm attack on their village -- these are only a few of the many images which have played significant roles in the evolution of the events which they recorded. That such images should be a part of basic courses in U.S. history seems an unassailable proposition. Furthermore, one could also argue that such images would be worthy candidates for inclusion in the kinds of cultural-literacy lists which various writers have developed in recent years (Hirsch et al., 1993; Simonson and Walker, 1988, pp. 191-200).

Cultural Understanding

Finally, a third argument for including knowledge of specific cultural images in a visual-literacy curriculum is related to the one above but may be somewhat less obvious. There are certain images about which one might want to instruct younger generations because of the role which they have played as a reference point in the public life of older generations. The art of Norman Rockwell may be the best example of this type of image in the U.S. This author's only encounter with Rockwell in an academic setting took place many years ago, in an art history course in college, in which the instructor once got his daily quota of laughs by treating the class to ten minutes of heavy sarcasm at the expense of one of Rockwell's *Saturday Evening Post* covers. But it should not be necessary to argue about the relative merits of Rockwell and, say, Jackson Pollock in order to make the point that Rockwell is worth knowing about if one wants to know about his society and his times.

What is at issue is not how accurately Rockwell reflected the "American character" (which is, in any case, a fictitious entity), nor what effect Rockwell's work may have had on the values of his contemporaries. Rather, Rockwell's distinction can be said to lie in the fact that his work became -- for believers and unbelievers alike -- a common standard against which to measure character and values (see Olson, 1983). Even today, an advertising photographer can speak of capturing a Rockwellian mood in one of his images (a Nikon ad of little leaguers in front of a New England church, photographed by Dewitt Jones [1989]), while debunkers of the mythical past go after their quarry by going after Rockwell.

Going beyond Rockwell, now, an especially interesting manifestation of this process of cultural reflection occurs in the case of certain well-known images which frequently serve as the bases of mass-mediated parodies. In such instances, the original image's power as a frame of reference is expressed directly in visual form, by virtue of the parody. Pride of place among the relatively small number of American images in this category surely belongs to Grant Wood's "American Gothic," which has provided the theme for several generations of variations on the nature of American identity.

In contrast to the works of Norman Rockwell, whose meaning most commentators seem to feel is only too clear, there is an ineffable quality about Wood's attitude towards the subjects of this image, and this quality is also present to some degree in two other frequently parodied U.S. images, James Montgomery Flagg's World-War-I "I Want You" poster, and J.A.M. Whistler's portrait of an elderly woman. The ambivalent note in these images is characteristic of a certain American attitude towards the past and may partly explain why these specific images have attained their unusual status in the national consciousness. Some degree of ambivalence also seems present in Steinberg's famous *New Yorker* cover, whose view of the United States as seen from Manhattan was, for some time, (and may still be) a ready metaphor for American class relationships and regional differences.

Testing Students' Knowledge

In an informal attempt to get some sense of how widespread people's knowledge of such images actually is, the author has recently been conducting informal tests of students' familiarity with a number of historical photographs, as well as pictures extracted from ads and some frequently-parodied images of the kind discussed above. Since the courses in which these tests have been performed all deal specifically with visual communication, the results can probably be taken as an indication of the likely upper limit of this form of visual literacy among the broader college-age population.

Historical Photographs

Among the various historical photographs tested so far, all of which were associated with events which happened before most of the students were born, there were two which had particularly high recognition rates: Walker Evans's 1936 photograph of an Alabama sharecropper's wife and Alfred Eisenstaedt's picture of a sailor kissing a woman on the day on which the Second World War ended. 83 percent of a class of 29 undergraduates (all U.S.-born) knew that Evans's picture had been taken during the Depression (despite the fact that this photograph is a facial close-up with no obvious signs of poverty or distress), and 73 percent accurately identified the circumstances of the Eisenstaedt picture. The corresponding figures were even higher for U.S.-born graduate students, and, interestingly, even graduate students from other countries had recognition rates of 50 percent or more for these two images.

On the other hand, however, none of the other photographs included in these tests had a recognition rate higher than 50 percent among undergraduates. For example, in contrast to the Eisenstaedt V-J day photograph, only 47 percent were able to give even an approximate description (e.g., a World War II battle) of the correct circumstances in Joe Rosenthal's photograph of the marines raising the flag on Iwo Jima (others thought that the scene had occurred in Vietnam, Korea, or, in one case, the Civil War). Similar recognition rates were also typical of such images as the civil-rights marcher attacked by dogs (several students thought that it was something that had happened in South Africa) or the assassination of Martin Luther King (several thought the people on the balcony in this scene were pointing at something in the sky).

Visual Parodies

In testing students' familiarity with the original sources of mass-mediated parodies, the method employed was to show them a parody and ask them to identify the original image on which it was based. This yardstick has tended to yield relatively high recognition rates for parodies whose original form was itself a mass-mediated image, such as "Uncle Sam," correctly identified as a recruiting poster by 83 percent of undergraduates, or Steinberg's *New Yorker* cover, which 63 percent of undergraduates were able to name as the prototype of a parody in which a different city took the place of New York. It is worth noting that in neither of these two cases could the students have had any substantial familiarity with the actual prototypes of these images, i.e., the poster itself or the magazine cover in its original appearance.

In contrast to parodies based on mass-mediated images, recognition rates tended to be lower for parodies of "high art." For example, only 37 percent recognized the image of Whistler's mother (in an advertising parody which actually contained the words, "A sale to make a mother whistle"). Since the students' exposure to either type of original would typically have come from reproductions, rather than from the original poster, magazine cover, painting, or whatever, differences in accessibility, in and of themselves, are probably not the main reason for these differences in recognition rates.

Advertising Imagery

The relatively high rates of recognition for parodies of images originating in the mass media might lead one to expect similarly high scores for conventional advertising imagery. This expectation has been borne out for some of the advertising images tested so far, but there have been interesting exceptions as well. Only one of the undergraduates and one of the U.S.-born graduate students failed to give a correct identification of the product most likely to be associated with the image of a cowboy (Marlboro) and a visual montage contrasting "liberated" and "pre-lib" versions of womanhood (Virginia Slims). Recognition of the Marlboro man was also high for international students (75%), although their scores for Virginia Slims were considerably lower (40%). However, certain other well-established conventions of visual advertising received uniformly low recognition rates regardless of the students' backgrounds. For example, only a third of the undergraduates were familiar with the use of parent-child images as a means of promoting investment advice and the selling of insurance. More seriously, fewer than a third of the students in any of the categories indicated familiarity with what is arguably one of the most pernicious of advertising conventions, namely, the association of cigarettes with pristine natural imagery.

Conclusion

The numbers cited above, together with those reviewed earlier in connection with the historical photographs and the visual parodies, give us some sense, perhaps, of the potential scope of any educational efforts to raise students' levels of the type of visual literacy considered in this paper. More generally, the aim of this paper has been to draw attention to this aspect of visual literacy and to encourage further exploration of its implications. Scholarship in visual literacy has been making significant ongoing contributions to our ability to deal with emerging imaging technologies and the visual media of the future (e.g., Beauchamp et al., 1994); but there is also some value in occasionally casting an eye backwards at the traces of the visual culture of the past.

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Audio Vision: Audio-Visual Interaction in Desktop Multimedia

Lee Daniels

Until recently, the resources needed to author multimedia computer programs required an abundance of time, advanced programming skills, and expensive hardware, relegating the development of multimedia products to professional developers and highly skilled researchers. Recent advancements in computer technology have produced desktop hardware and software that is more powerful, flexible, affordable, and user-friendly than ever before. Sophisticated multimedia authoring programs that are easy to use (i.e. Hypercard™, Digital Chisel™, etc.) allow the non-programmer to author multimedia productions that rival the best of commercial products. These new authoring applications provide text, visual, and sound resources which can be incorporated into a rich computer mediated environment by both educators and students. As a result, many resources are available to guide the amateur programmer in designing multimedia programs and improving visual presentations.

Audio, on the other hand, has been almost an afterthought. Due to the lack of research in the use of audio in instruction there is are few resources to assist the multimedia producer in using sound effectively and efficiently in multimedia (Thompson, Simmonson, & Hargrove, 1992). As a result, most authors either utilize "stock" sounds that are "thrown in" without contemplating or understanding the relationship between audio and visuals, or ignore the audio medium altogether. Too often, a sound effect or music segment is used solely as a device to gain attention, and not as an integral part of the multimedia message.

This paper attempts to address this problem by providing some basic understanding of the cognitive and affective effects of audio when used with visual material in a computer mediated environment. In addition, some general tips on choosing and manipulating audio elements are presented.

The Foundations of Multimedia

Although the term multimedia has been used for years by both educators and industry, there is little agreement on an exact definition (Strommen & Ravelle, 1990). For the purposes of this paper the term multimedia refers to a computer mediated environment that incorporates two or more media types such as images (still or moving), text, graphics, sound, and other data.

The effectiveness of multimedia as an instructional medium is based on the theory of multiple-channel communication. Multiple-channel communication involves synchronous presentation of information "...through different sensory channels (i.e., sight, sound, touch, etc.) which will provide additional stimuli reinforcement" (Dwyer, 1978, p. 22). The benefits of adding additional media channels when communicating is offered by Severin's (1967) cue summation theory which asserts that learning will be increased when stimuli that share information are presented because they reinforce each other. An alternate view of communication assumes that there is only one channel of communication, and that additional cues across channels offer no advantage, and run the risk of "overloading" the human processing system (Travers, 1964). In an attempt to reconcile the two theories, Hsia (1968) hypothesized that communication through multiple channels could be more effective so long as the central nervous system was not overloaded. In their

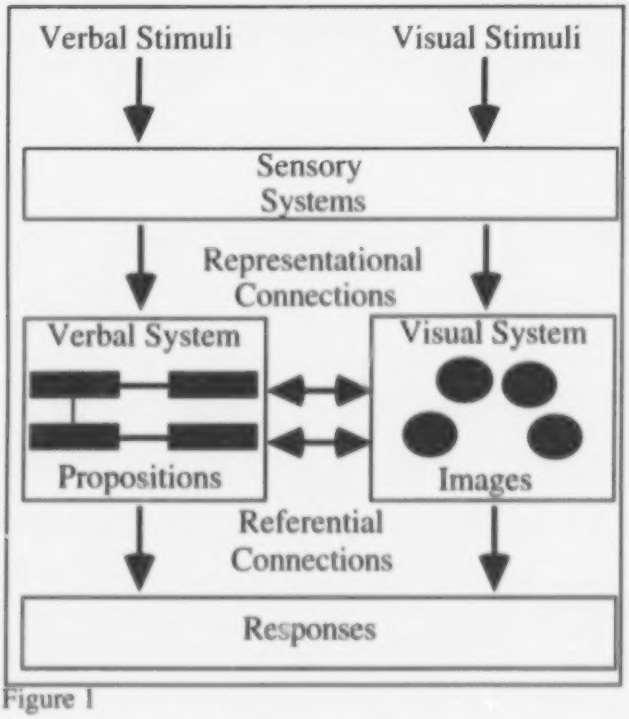

Figure 1

review of multimedia literature, Moore, Myers, & Burton, (in press) suggest that when *highly related* cues are summated across channels, multiple-channel presentations are superior to single channel presentations .

Another integral component of multiple-channel communication is Allan Paivio's dual coding theory (Paivio, 1991). Paivio's theory is based upon the assumption that memory and cognition are served by two separate symbolic systems, one specialized for dealing with verbal information and the other with images. Pavio (1971) defines an image as "...nonverbal memory representations of concrete objects and events, or nonverbal modes of thought" (p. 12). Paivio distinguishes images from verbals which relate to speech or a language system (Paivio, 1971). While visual stimuli is normally associated with images, other modalities (i.e. auditory) may also produce images. Although each system can function separately, most processing involves connections between the two systems (see figure 1). The word "car" for instance, may translate into images of cars, and likewise, a visual of a car may form the verbal symbol (word)"car". Paivio points out that although words *can* be imaged, images are associated with verbals automatically, which would explain the superiority effect of visuals (Pressley & Miller, 1987).

As noted earlier, both text and speech are received as verbals. In addition, concrete sounds can be interpreted as images. Thus, dual coding is not effective when the information sources are coded within the same mechanism (Barron & Atkins, in press) This concept is important to remember when one uses audio in conjunction with visuals. Narration with text *does not* constitute an additional channel, and *can* cause intra-channel interference. Likewise, combining sound effects and visuals presents the same danger.

To summarize, it appears that when information is presented across channels, it should be highly correlated to improve learning and avoid inter-channel interference. Additionally, The multimedia author should ensure that images or verbals presented across channels are not conflicting.

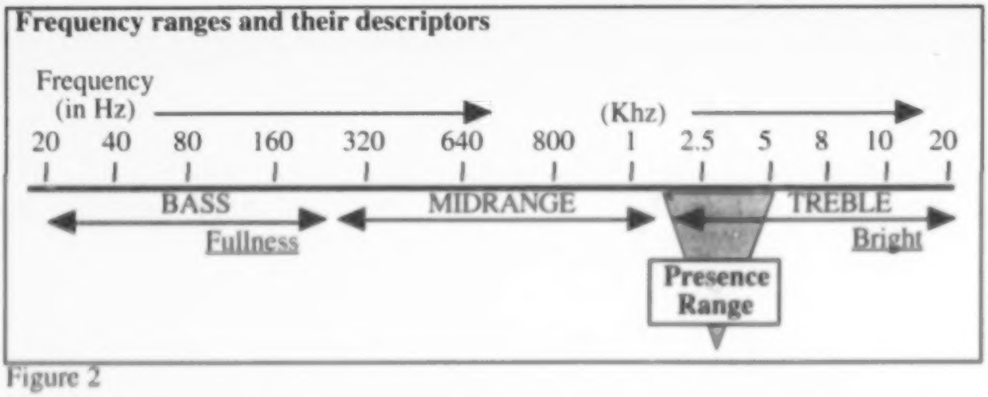
Frequency ranges and their descriptors

Figure 2

General Properties of Sound and Perception

Sound is perceived by the brain as a description of the object that emits the sound *and* the environment that the sound occurs in. The sonic *quality* of a sound allows the listener to make judgments about the spatial location, relative size, and environment of the sound (Runstein & Huber, 1986). When combined with visuals, these characteristics can enhance or confuse the visual message depending on how the aural and visual attributes relate to one another. All sound elements share the characteristics that define location. The spatial location of a sound is perceived by tone quality, relative volume, and amount of reflections (echoes/reverb).

Tone quality refers to the brightness or dullness of the sound. Sounds that are farther away have less high frequency information (treble) than those that are closer. Sounds farther away contain more low frequencies (bass). Our hearing apparatus is most sensitive to sounds in what is known as the presence range (see fig. 2). By amplifying a sound's spectral content in this 2kHz-5kHz range, the audio appears to be closer, louder, and more intelligible. Additionally, sounds that are farther away tend to have a lower pitch than those that are closer (Rossing, 1982).

Sounds that are closer, obviously sound louder than those at a distance. When placing a sound/image source at a distance it should be audible, but to some degree softer than those placed in the foreground. As noted above, sound sources that are at a distance tend to have more reflections or echoes, than those nearby (Rossing, 1982). In addition to defining space, these same characteristics also identify location and movement. In order to define movement, stereo sound is desirable, wherein the intensity of the sound changes as its source moves laterally. Even in mono however, a change in volume, tone quality, and pitch can enhance the perception of movement. When using sound effects in multimedia, many authors overlook the importance of matching the aural and visual characteristics of space and location. A wolf visually placed in the foreground conflicts with the sound of a far away howl. Similarly, moving objects whose sound is static can cause confusion in the viewer. This is especially important when cognitive information is being supplied by the audio track. Often in animations depicting physical, mechanical, or scientific properties, the sound of the action or process can serve as a valuable cue to the information being presented. The sound of a malfunctioning part is often as important as the image itself.

The size of a sound source is usually intimated by pitch and echoes. A deep pitched voice with lots of echoes would imply a large, perhaps ominous being, while high pitched canine sounds conjure up images of puppies rather than large dogs. When a sound is placed inside an environment, the reflections should match the environment. A cavernous pit would entail many echoes, while a classroom interior would have little if any echoes.

Sound also contributes to the pace of visual presentation. Narration, dialogue, sound effects, or music can establish a fast and hectic pace or a slow and somber mood to compliment the visual. Although often overused, unique audio elements are excellent ways to gain and maintain attention throughout a multimedia program. Musical interludes, odd sound effects or different voices can alert the viewer to pertinent visual elements or serve as a reminder to stay on task. These same devices can also be used to signify transitions to new topics or themes. Recurring music and sound effects are often used to identify characters, events, or places as when a rattle identifies the villain, or a happy melody signifies the protagonist (Alten, 1990).

Audio Elements in MultiMedia Production

There are only three audio elements that the multimedia developer has to work with: 1) Speech, 2) sound effects, and 3) music. Initially, this may seem to comprise a small arsenal of communicative tools when compared to the multitude of visual elements (color, texture, angle, etc.) available to the multimedia designer, especially considering the superiority of visual memory. However, one only has to look at the effectiveness of radio as a medium for communicating cognitive and affective information, or to the excellent use of audio in many documentaries such as Ken Burn's "The Civil War" to realize that sound has a substantial impact in a "visual" medium.

Speech

Speech can function as either narration or dialogue. Narration, like text, is often used to deliver concrete information. When presented with text however, narration should be highly redundant since both text and speech are perceived as a verbal proposition. Any dissonance between the two channels can distract the user, cause interference, and result in less retention, or misinterpretation. Therefore, narration is most useful as a replacement *of* text and not as addition *to* text.

One instance when narration is more appropriate than text is when screen space is at a premium, and additional text would reduce the visual impact (i.e. a complex scientific display or detailed artwork) (Barron & Atkins, in press). Narration is also preferred when it is necessary to direct the viewers attention to details of the visual. Consider a program dealing with artistic details and attributes. Text often is used to guide the viewer to specific attributes (figure 3). Narration would allow the viewer to concentrate on the visual image rather than moving from text to visual. In addition, the focal point of the screen, the image, is able to occupy more screen space (figure 4).

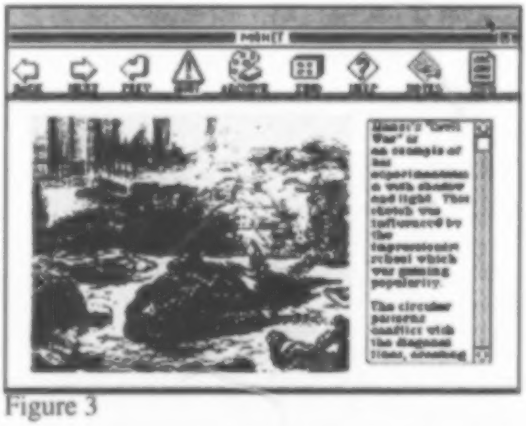

Figure 3

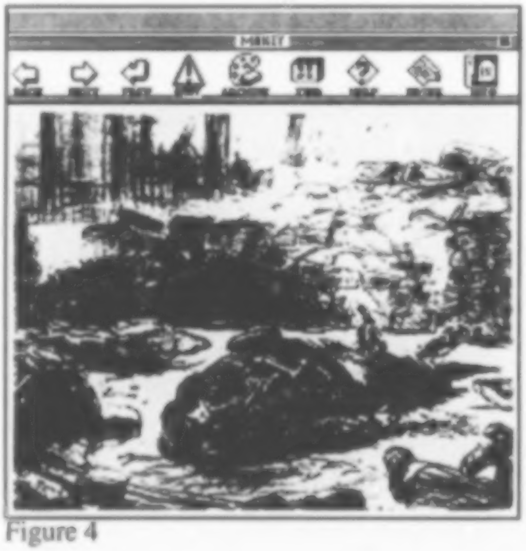

Figure 4

The pace of narration or dialogue can also heighten the intensity of the visual. A fast moving narration adds to the intensity of time lapsed animation, for instance, while a slow, steady narration compliments the somber

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mood of a hero's funeral. Similarly, fast paced dialogue between two characters can reflect tension, anger, excitement, or nervousness. Smooth, even paced dialogue reflects friendliness, relaxation, and confidence.

As noted earlier, the tone quality of the narration can have an effect on the listener's perception. A narration that is bright and present is perceived to be closer, and therefore, more intimate and trustworthy as opposed to speech that sounds dull and distant (Alten, 1990). Also, a narration track with an amplified presence range will be more intelligible and require less volume to be heard over music or sound effects (Woram, 1989).

Sound Effects

We usually think of sound effects as being contextual, literally interpreting the visual as it appears. Such is the case of a dog's bark, the roar of a jet engine and the like. However, they can also serve a narrative function by adding more to a visual's apparent information (Alten, 1990). Descriptive effects contribute to the subtle, sonic aspects of an image. For instance the sound of gentle ocean surf may include gulls, people playing, and boat sounds to set a particular mood. Commentative sound also tells more about an image, usually unrelated to the visual itself. Imagine a program about air pollution, and a scene of city traffic. Treating and blending the car engines to sputter and "cough" comments on the detriment to the air we breathe.

Music

Perhaps no other sound is as effective as music in communicating complex emotions and moods. Music, can define a locale with ethnic melodies. It can establish time with musical elements that suggest a period in history such as the 1960's or the Roman era, etc. Music can identify characters and events with recurring themes. as well as providing transitions from one idea to another. Varying tempo and rhythm, contributes to pace can provide counterpoint to the visual to create tension and irony.

Silence

Probably the most underrated sound element is silence. Silence can have enormous affective impact, especially when it is unexpected. Silence creates tension simply by letting the user's imagination "fill in" the sound. The aftermath of a plane crash or the disappearance of a character in a story both lead to suspense as to what will happen next. Another excellent use of silence to build tension (and a staple of horror movies) is to slowly remove sound elements one at a time so that the absence of sound "sneaks up" on the viewer.

The Roles of Audio

When audio and visuals are presented concurrently, the audio-visual relationship takes on dynamics and meanings that are different than when either media is presented alone. When combined with visuals, audio assumes one of four roles: 1) Picture defines sound, 2) sound defines picture, 3) sound parallels picture, and 4) sound counterpoints picture.

Sound Defines Picture

Imagine a multimedia program on the Brazilian rain forest. A still image of the jungle interior is accompanied by the solitary sounds of the environment: rainfall, bird calls, and other animals, along with lively ethnic music. Alternatively, the sound element could contain the sound of chain saws, machinery, and ominous music. Two different interpretations of the rain forest are implied.

Picture Defines Sound

The sound is defined when the visual image is so strong, that the accompanying sound is a literal translation of the image. A raging tropical storm, with crashing waves and bent palms nearly demands a soundtrack that consists of wind, surf, and rain sound effects. Audio is supportive of the dominant visual, reinforcing the image.

Sound Parallels Picture

This is the most common relationship between audio and visual elements. In this relationship the audio element combines with the visual element to create a mood or deliver information that is more potent than either element alone. The sounds of battle with gunshots, cannon, and anguished screams compliments the visual of a battle scene. The ferocity and destruction of war is conveyed by both media separately, but is intensified by both elements together.

Sound Counterpoints Picture

When sound counterpoints picture, both media contain unrelated information that creates an effect that is not conveyed by either media alone. For example, in a presentation on the civil rights movement, irony is created when a visual montage of segregated public facilities is underscored by a reading of the United States Constitution.

Summary

Many affordable sound editing programs (such as Macromedia's SoundEdit™) give the multimedia author the power to manipulate sound files in nearly any way imaginable. By adjusting tone, pitch, volume, duration, and other sound characteristics, sound files can be fine tuned to fit the specific visual element. Using these techniques, the same sound file can treated in many ways and used as several sound effects. Narration or dialogue can be edited to establish pace. Voices can be altered via special effects to establish identities, and allow the same voice talent to become several characters. Increasing or decreasing musical tempo and pitch is also possible.

The examples mentioned above are intended only as guides only - not hard and fast rules. The key to finding the best audio for a particular visual is to experiment and listen carefully. As with any other aspect of multimedia design, the audio element is somewhat intuitive and changes with each new situation. Beta versions should be developed and assessed before deciding on the final product. It is also good practice to pay close attention to the multimedia programs that you admire, or ones that are successful, chances are they have high quality, well designed audio elements. Try to discern what the audio elements are, how they were produced, and how they relate to the visual. Keep a log of devices and techniques that work and adapt them for your programs - there's no need to reinvent the wheel!

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The Evolution of a Drawing

Gail Delicio
Linda Reardon

"What is the criterion of the visual experience?" Does a drawing embody the form and focus of what the artist actually sees, or instead, is it only after seeing the finished drawing that the artist knows the true meaning of his visual experience? This study seeks to answer questions like these posed first by Wittgenstein, in the *Philosophical Investigations* (1953), and addressed later by Wollheim in his treatise *On Drawing an Object* (1978). We tested their models by providing a running record of the perceptual and cognitive activities of two children as they made drawings on paper attached to a computer digitizing board. The analysis of verbal and "visual" protocols synchronized in real time allowed us to make inferences about the artist's judgments as they drew.

The study of the visual image as it manifests itself in drawing has long been a topic of interest to us, since we have served both as artists and art teachers during the early parts of our careers. There is a certain intrigue attached to the idea that, when given the directive to "draw from life," (i.e., draw naturalistically) the most pervasive quality to emerge in the drawings of individuals is *uniqueness* of expression. No two students produce the same drawing, regardless of how structured the assignment or how disciplined the class. This phenomenon moves us to ask once again Wittgenstein's question, "What is the criterion of the visual experience?" (p. 198, 1953). Is there a criterion, or as he puts it, a "concept of the representation of what is seen," against which people judge their drawings to be correct or incorrect, adequate or inadequate?

Knowledge and the Visual Experience

In *Philosophical Investigations* (1953), Wittgenstein comments that the criterion of the visual experience is nothing more than the representation of what is seen. If we take the notion of representation to mean a drawing of what is seen, then it follows that one might learn what is seen by examining a rendering of it (regardless of the fact that the information perceived during a visual experience is hidden to all but the viewer). Certainly, we can discover what is seen by others by observing their drawings, but it makes no sense to think that we discover, after the fact, what we ourselves see by observing our own drawing of it.

Generally, it is not difficult to respond to a drawing executed with a quality of near-photographic realism with the belief that the artist has revealed to us the impression of what he saw. This does not apply in viewing an inadequate drawing done by an artist who lacks training in draftsmanship, however. In this case, we need more information about the object of the drawing in order to deduce the criterion which inspired the representation. The drawing, thus, cannot be the criterion of the visual experience.

Consider the intentional graphic abstractions produced by certain artists. Are these to be viewed as variations on the criterion? If so, the criterion of the visual experience must be something that extends beyond the drawing itself. Indeed, it is *knowledge* of the visual experience that drives our representation of it. The form of this knowledge is neither a "lingering image" (Wollheim, 1978, p. 254) nor an "inner picture" (Wittgenstein, 1953, p. 196), but rather a predisposition that enables the creation of an image. It is established at the time of the visual experience, manifests itself as part thought and part image, and is more than a just a description of facts.

Perception and the Judgment of Correctness

Knowledge of the visual experience is present in varying degrees, contains the defining characteristics and distinctive features of what we see, but may not be readily accessible in its entirety at all times. We pick up, or perceive, different aspects or dimensions of what we see. Wittgenstein comments that familiarity with the various forms of visual impressions (for example, shape constancies across 2-D and 3-D space) enables one to "know one's way around the drawing," and to demonstrate "fine shades of behavior" that distinguish faulty productions from those that are correct. At the very least, this type of knowledge will ensure that certain mistakes are *not* made, notably, that the featural invariants of form are present and recognizable (e.g., as when a circle viewed at an angle is represented as an ellipse).

It is possible that the criterion upon which a drawing is made can be faulty in itself, and that it can produce, in turn, a faulty representation. To illustrate this effect, Wollheim offers the example of an academic exercise involving the act of drawing upon the "diaphanous plane"— tracing a landscape seen through a transparent sheet of paper. The product of such an exercise, when viewed as a stand-alone drawing, generally appears to be flat, mechanical, and although replete with contour, lacking in the feel of natural relationships of shapes in space. So, what can the artist do but bring the drawing in line with his general knowledge of perceptual constancies in the scene? And he does this through the trial-and-error process of correction and reconstruction. In this case, no criterion is needed, and the drawing is brought up to standard by comparison with knowledge of expected invariants of form associated with the actual visual experience.

Method

The problem of identifying the criterion of visual experience is easily addressed within the medium of philosophic inquiry, but can it stand up to empirical investigation in the "real" world? We shall now present a method by which the verbatim accounts of experiences encountered during drawing are matched with the real-time images of drawings in progress. Our subjects are two children—Sam, in prekindergarten, and Erin, in first grade. Even though the models presented by Wittgenstein and Wollheim do not account for developmental differences, we feel that the theories should apply regardless of the age of the participant.

A non-directive drawing task, "draw whatever you like" was presented individually to our two young subjects. Objects were available to "draw from life," but both chose to draw from their imaginations. (Perhaps our first encounter with developmental difference is noted here—most of the adults we dealt with earlier were more satisfied with a directive, such as "draw this apple," than with the nondirective request). Additionally, they were asked to think aloud as they drew. Both children drew on 10" X

10" sheets of paper attached to a digitizing board connected to a Macintosh computer, and protocols for both were audiotaped. A screen recording program documented the drawing as it unfolded, and the resulting file was saved as a "tape". Later the computer- and audio-tapes were synchronized and played back for analysis. Selected clips from Erin's and Sam's presentations were extracted and saved as PICT files. These clips appear on the next two pages.

Analysis of Erin's Drawing (First Grade)

As we searched for the "criterion" that inspired Erin's drawing of the "Garbig Monster", it occurred to us that it might be found in knowledge of the Sesame Street character "The Grouch" ("he loves garbage...loves garbage cans"). Erin also pointed out that "her brother draws it (the monster) all the time," and directed our attention to the formal details of his build (the neck that pops up and down whenever he wants, hands on his knees, long fingernails, three stomachs, and an ugly toe).

She seemed to be creating spontaneously and without hesitation, first constructing the central image of the monster, and then adding figures one by one until the composition was complete. Erin expressed sheer delight and a sense of surprise at the emergence of the figures, as if they appeared out of nowhere. To some degree, this behavior supports the Wittgensteinian notion that various knowledge levels of the visual experience are available, and that the drawer cannot predict which one will present itself at a given time.

There was clearly no preconceived plan to the drawing; however, it was evident that Erin made a concerted effort to organize and balance the composition. Figures were added sequentially to the left and right of the central figure, until pictorial space was adequately filled. We conducted an additional analysis of balance in the drawing using methods devised in earlier studies (Delicio, 1989), and found the drawing to possess a very high degree of bilateral balance. The ratio of figural space between the upper-left and lower-right diagonal halves is 2368/2600 or .9108 (see Appendix).

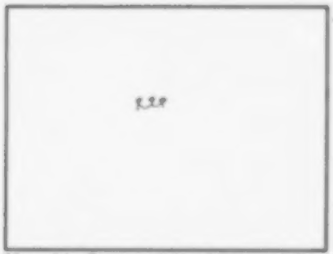
The idea of representing a faithful image of her visual experience did not appear to be of interest to Erin...what she deemed necessary simply took form. She did not request an eraser, nor did she express concern about errors in drawing. Her final (unsolicited) statement, "I didn't notice that I was going to draw him..." , verified the notion that she started the drawing without conscious knowledge of a specific personal visual experience. She continued to draw until the drawing was finished—label, frame, and all.

Analysis of Sam's Drawing (Prekindergarten)

Sam's protocol indicated that the knowledge underlying his drawing of the "Ninja Turtle" was also inspired by a television character. His method was deliberate and slow, and he had difficulty thinking aloud without prompts. Nevertheless, like Erin, he proceeded in a stepwise fashion, adding figures until the space on the page was filled.

Sam's work was accompanied by a story that seemed to synthesize elements of fantasy in the drawing, and elements of reality at home. The NinjaTurtle was caught in the act of skate-boarding on the kitchen floor: "...he's going to get in big trouble...he thinks he ain't but he is!".

Sam incorporated an interesting element of organization in his drawing by enclosing all shapes within a circular framework which he described as "the T.V." (Recall that Erin was also compelled to place a frame around her work). The all-



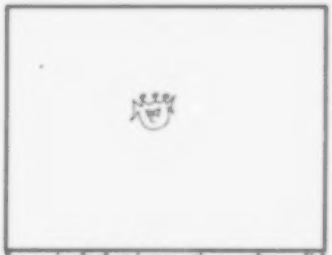
Um, this, I am making the ears right now, and they've got rings around them because he thinks he's an angel, but he's not.

Tell me what you're doing, try and talk your way through it.

I'm making the rings, now I'm making the other ears.

Goodness, you're quite an artist.

Now I'm making the head. He's got ugly eyes...it kinda looks like a bow but it's not.



I see, isn't that interesting...where did you see this animal?

My brother draws it all the time.

Oh, he does...what grade is he in?

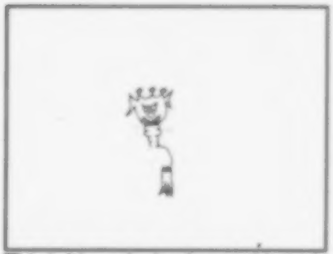
He's in third...but I don't like him.

Why not?

I don't know.

What grade are you in Erin?

I'm in first.

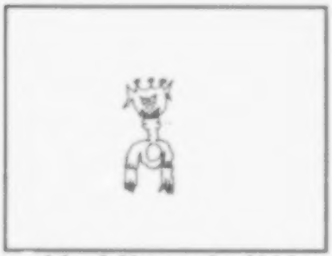


This is his neck...by the way his neck pops down whenever he want's it to. So I'm going to make it like it's going up.

Kind of a telescoping neck, huh?

Yeah, my brother's got a monster like this

... then he's got his hands sitting on his knees...he's got long fingernails...there's his knee, there's his ugly toe



...and there's his stomach, which he has 3 stomachs.

Oh he does...why does he have 3?

Cause he eats a lot.

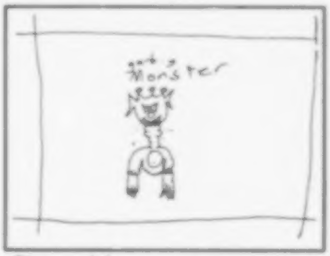
His arms are painted different because his mother snapped off some of his fingernails and they won't come back.

Oh goodness, why did she do that?

I don't know.

Does this monster have a name?

Yes, can I write the name on the top?



Oh, certainly.

Could it be Garbig Monster?

Yeah, yeah... and I'm going to write, could I draw a frame around him? Absolutely, anything you want.

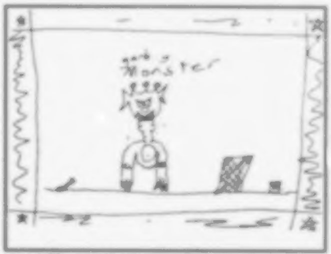
To make my...I'm making a picture out of it.

I see. What are those for?

That's just part of the frame

I see.

He loves garbage, so that's why I'm making it go around.



And I'm going to make some garbage around him because he loves garbage...loves garbage cans.

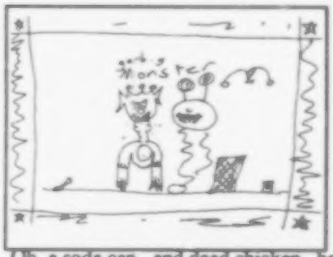
This is just the way I make garbage cans.

They look kind of garbage cans I've seen before.

You know, he takes everything out so he can see what he wants.

What is that?

Soda!



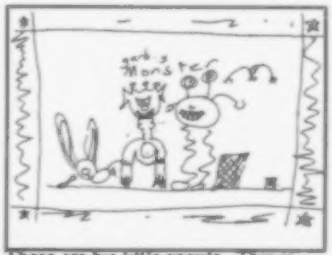
Oh, a soda can...and dead chicken...he ate off of it Somebody already ate off of it and then he ate off of it.

And there's a birdie in the sky...with his tail sticking up, and he's got hands on his wings so he can fly and grab things, and he has a friend monster which I'm going to draw him. And I'm going to make his friend pet, too.

Looks like a happy monster.

What's that?

Those are his legs, and he's got alien hands...out of his head.



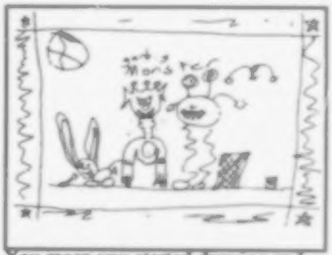
These are his little snouts. This is going to be his dog. He's got a weird tail.

Is the dog standing behind Garbig Monster?

No, he's right beside.

He's got bunny ears...and a big huge nose, weird eyes, one big...one really tiny., He's got weird feet. And here's the moon. There. I'm done!

I like that. I didn't notice that I was going to draw him because ...



You mean you started drawing and you didn't know what it was going to be?

Yeah

Really?

That's when I tried the Garbig Monster.

And you did not need an eraser?

No.

This is really super Erin.

Figure 1: Erin's Drawing Protocol for "GarbigMonster"

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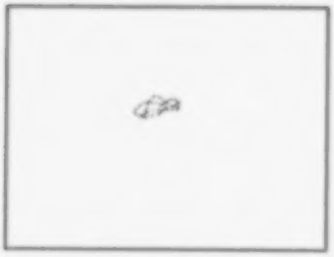
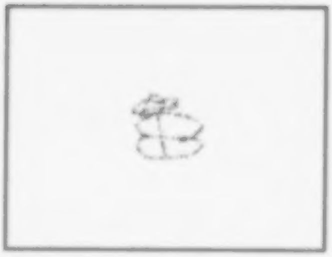


Go ahead and draw a picture...maybe you could talk to me about what you're drawing. What are you drawing, Sam?

A ninja turtle.

What is that shape?

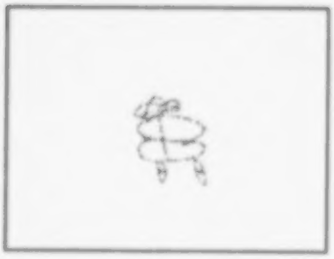
This is his head...and this is his head.



Oh, I see, that round thing is his head.

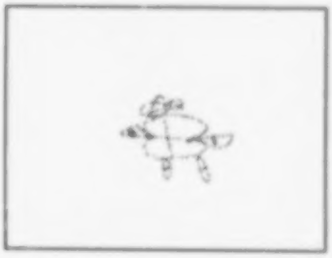
What is that?

His body.



And those are...?

His foots.

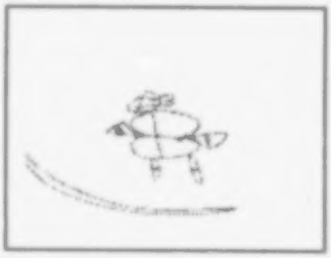


Where have you seen a ninja turtle before?

Um...on TV

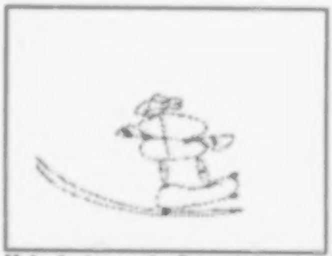
What are those?

His hands.



Goodness, what is that big shape?

The floor.



He's skating on the floor...he's going to get in big trouble.

Oh, he is?

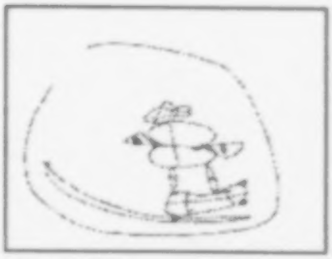
Um hm...

Why is that?

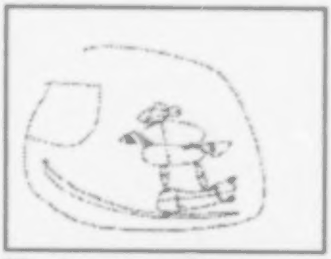
Because he's getting in big trouble because he's riding on the kitchen floor.

Oh-oh, he's not supposed to ride that skate board on the floor.

No, but he's going to get in trouble. He thinks he ain't but he is.



That's the T.V.



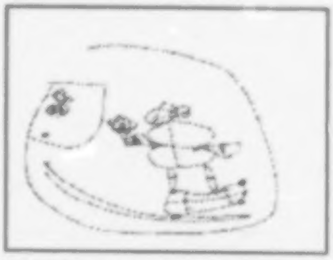
What do you have over here, Sam...those two flowery looking things? What are those?

Um, that's the things that you turn.

Oh, on the T.V....the dials or the knobs?

Yeah.

I see.



It looks like he's holding something.

A flower.

Very nice. That's good, that's very good.

Figure 2: Sam's Drawing Protocol for Ninja Turtle

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encompassing frame appears to be a mechanism by which the child imposes continuity and order in the composition. An analysis of balance performed on Sam's drawing also indicated a very high level of bilateral balance. The ratio of figural space between the upper-left and lower-right diagonal halves is 1579/1682 or .938 (see Appendix).

When asked "what are those two flowery looking things?" he replied, "that's the things that you turn" (knobs), and then proceeded to draw a flower in the hand of the skate-boarding Ninja. Sam's knowledge of the visual experience seemed to be constructed as the drawing evolved (much like Erin's), and apparently was very sensitive to my suggestion of the flower image. Like Erin, Sam expressed no concern over inadequacy or incorrectness in his drawing (even though the resulting image was far from naturalistic), so there was no need to bring the drawing "in line" with the visual experience. He seemed very pleased with the final drawing, and enjoyed the fact that I liked it too.

Discussion

In retrospect, we are very pleased with the methodology that we devised to investigate the problem of identifying the criterion of the visual experience. It provides an ecologically valid approach to the collection of "visual" and verbal protocols that are associated with freehand drawing, and produces copious amounts of data that can be analyzed both qualitatively and quantitatively. In future studies, however, we advise that the subject pool be more varied with respect to age to account for developmental differences in verbal expression and drawing production, and that it should especially include the adult artist.

It is apparent to us that the most powerful force guiding the evolution of a drawing is not the concept of the representation of what is seen, but rather is the sense of organization and balance of that representation on the picture surface. It is this sense of organization that overrides feelings of inadequacies in draftsmanship, and inspires the artist to give form to meaning.

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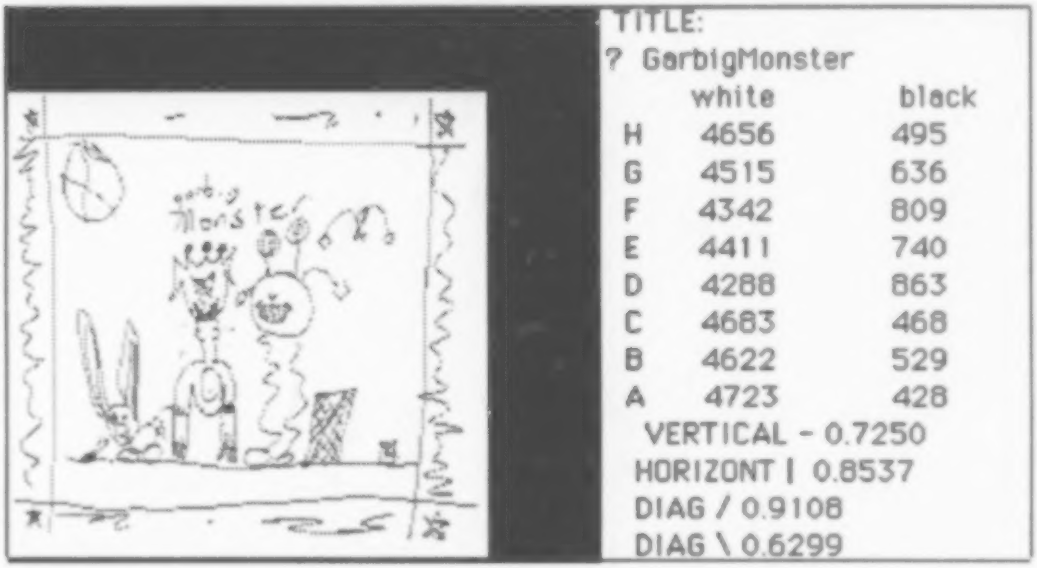
Appendix

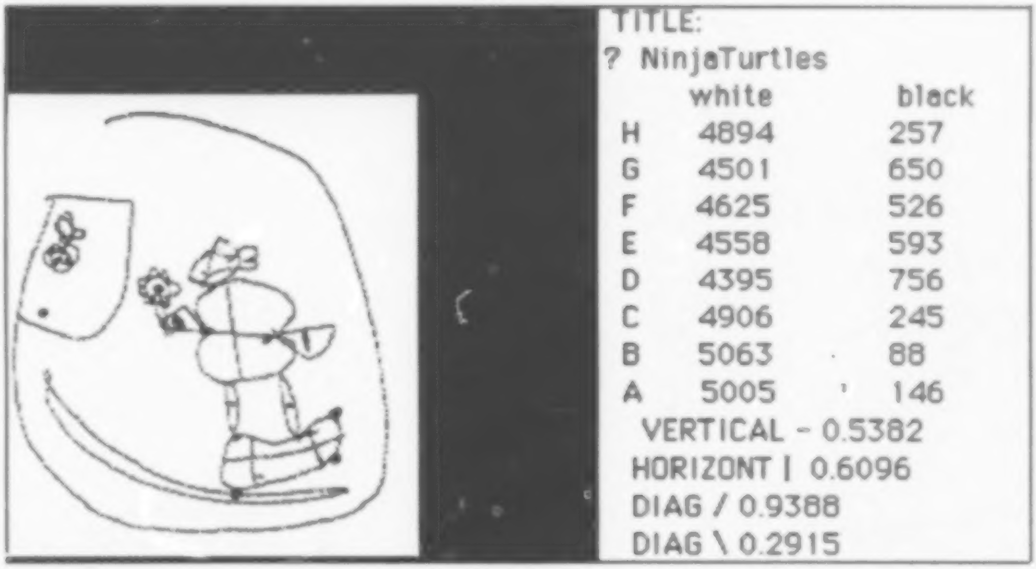
Note: Each picture is parsed into eight sectors (A-H), and the strength of figural space in each sector is computed by summing all black pixels. White pixels indicate ground space. Balance estimates associated with the four principal forces of structure (vertical, horizontal, and right-left diagonals) are computed by taking the ratio of the weaker half to the stronger half.

1. Analysis of Balance for Erin's Drawing



```
TITLE:
? GarbigMonster
       white      black
 H     4656       495
 G     4515       636
 F     4342       809
 E     4411       740
 D     4288       863
 C     4683       468
 B     4622       529
 A     4723       428
  VERTICAL - 0.7250
 HORIZONT | 0.8537
 DIAG / 0.9108
 DIAG \ 0.6299
```

2. Analysis of Balance for Sam's Drawing



```
TITLE:
? NinjaTurtles
       white      black
 H     4894       257
 G     4501       650
 F     4625       526
 E     4558       593
 D     4395       756
 C     4906       245
 B     5063        88
 A     5005       146
  VERTICAL - 0.5382
 HORIZONT | 0.6096
 DIAG / 0.9388
 DIAG \ 0.2915
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Layered Worlds: A Metaphor of Time, Visualizing the Experience of Alzheimer's

Ann M. Grady

Time out of sequence. . .The past overtakes the present. . .The pace picks up. . . The present becomes a blur.

Alzheimer's, a disease which alters judgment, memory, and understanding, interrupts our human experience of time. As a daughter whose mother lived with Alzheimer's disease for 10 years, I recently chose to use photography as the medium to interpret Alzheimer's visually. Photography, the guardian of our memories, entrusted with our past and present, bequeathed with memories for future generations was a medium suited for interpreting that disease which sharply disturbs those memories, those hopes for the future.

A LAYERED WORLD
that holds richness
and threat alike
in its grasp -
that is the experience
of this exhibit.
That is the experience of
Alzheimer patient
and caregiver alike.
These images invite you
to enter that world.

In this article I will verbalize, as much as possible, my work of visual interpretation that culminated in an exhibit, *Layered Worlds: The Look of Alzheimer's* which was presented in the Carney Gallery, Fine Arts Center, at Regis College, Weston, MA, March 14 - May 23, 1994.[1] I will conclude with mention of works of other artists who have been involved in a similar endeavor – both visual and verbal.

Photography Guardian of Memory?

The camera turned to capture faces of Alzheimer's was not my choice. The look of Alzheimer's on the face of the victim of the disease spoke too strongly of what had been lost. That I did not want to photograph. To photograph that look of Alzheimer's seemed to reinflict the pain of the disease once again.

There was another look of

Alzheimer's that I set to interpreting. I looked to interpret the experience of Alzheimer's disease for patient, for family members, for caregivers. What does the experience look like? What is the experience of Alzheimer's and how can that be visualized?

A Disrupted World of Time

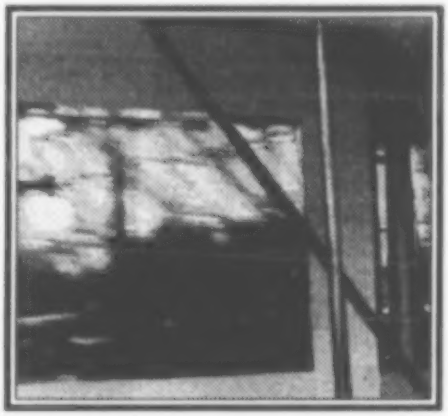
As one who is at home in the world of metaphor, I sought an image that could convey the experience of a world of time, a world of layers of past, present and future, layers that are at times out of touch with each other, layers whose sequence is often out of kilter.

The camera proved to be a very apt medium for my message. The world of nature, of windows and carousels seen through the lens of the camera became transformed. I was able to utilize the capabilities of the technology as a means to explore and express the Alzheimer experience. Shallow depth of field, the blur of motion, the shadows and textures created by back lighting, worlds reflected in windows, moments frozen in time - these were the tools which allowed me to explore the world of Alzheimer's. Once I had set myself the task of utilizing the metaphor of a layered world, I was able to explore some of the varied manifestations of the disease as well as the many moments in the lives of patients and caregivers where the experience of time is integral.

Worlds In and Out of Focus

Images with shallow depth of field conveyed the world of both patient and caregiver, a world where a momentary glimpse of recognition is surrounded by the fogginess, the blur of forgetting. The lack of recognition by the Alzheimer patient who cannot make the connections is mimicked in the experience of family and caregiver who now only catch momentary glimpses of the person they know and love. The one moment of recognition when the patient knows who you are epitomizes the layers of time that are constantly moving in and out of focus. That moment of recognition will later be followed by blur, a world in which things and people are no longer clear.

Some images in the exhibit convey the blur of motion, a blur experienced during the progression of the disease when the pace of life picks up. Caregiver and patient alike feel as if they are propelled headlong into an uncertain future. The blur of images taken from the moving carousel proved to be rich images to convey the confusion as well as the dignity of the person trying to survive. The head of the horse on the carousel seems to move courageously into the world, which has now become a blur.



Time's Sequence Gone Wrong

The disease often and abruptly moves people back to another time, another place. At other moments patient and caregiver alike are propelled into a world where the normal pace of time is speeded up. Past, future, present seem to be moving in the wrong direction. It is hard to tell if one is moving from today to tomorrow or to yesterday. The carousel horses that appear to be moving in all directions at the same time epitomize for me this experience of Alzheimer's.

Into Another Time, Another Place

Images reflected in windows were interesting images. Such beauty – but also a world in which one is not certain where one layer of reality begins and another leaves off. For me the images in the window expressed the experience of family members, always moving in and out of varied worlds – the day to day world with its cares and responsibilities and the world of the patient, which at some moments during the disease, manifests a beauty, a world of its own. The world of the patient does not share the same rules as the world of daily life. However, it has to be accepted as the world of the patient – no matter how ephemeral it might seem to another onlooker.

An Affirmation of Time

As difficult as the disease is for all touched by it, it is also important to notice the moments of respite, moments when for however brief a space, time seemed to settle back into its normal sequence. The cranberry series with its sharp images and rich colors spoke clearly of a life to be affirmed. People and events were able to be recognized for what they had been. Glimpses of the life that had been were able to emerge.

Works of Other Artists

Other artists – both visual and verbal – have also worked at interpreting the experience of this disease. Elie Wiesel, in his novel *The Forgotten* uses images of sieves, of autumn leaves to convey the experience of a mind that is losing its former abilities.[2] Annie Ernaux, in her work, *A Woman's Story*, recounts incident after incident from the life of her mother that epitomize what is lost.[3] These incidents give flesh to the experiences behind the metaphors in my exhibit.

Even in the work of a photographer, Nicholas deCandia, who chose to photograph a woman who was experiencing Alzheimer's, we see him reaching for words and images that embrace the experience of the disease. In his large collage, **fragmentation** is the predominant image, trying to mirror back some of the experience for patient and caregivers alike.[4]

Printmaker, Eleanor Rubin, together with her sisters, Joanne Leonard and Barbara Handelman, presented visual and verbal interpretations while they were in the midst of living through their mother's experience of Alzheimer's.[5] The comments of their mother's physician embody the layered world that is Alzheimer's when he said, "Listening to your mother is like coming across cathedrals still standing in a bombed-out city."[6]

A World of Great Achievement as well as Devastation

As I worked on my project and was able to visualize some of the disorientation of the disease, I also became convinced that it was important to step back from the experiences of the disease and look once again at the life that had preceded the disease. The disease was not to be denied but neither were the experiences that had preceded the onset of the disease.

Layered Worlds:
The Look of Alzheimer's

Leaf Series
Cranberry Series
Carousel Series
Window Series
A Celebration
of Layers

One panel of my exhibit was titled, *A Celebration of Layers*. In this I wanted to celebrate the many moments of time that had been as well as look at the present experience. This celebration of layers does metaphorically what the photograph album is able to do. It affirms the many moments of time, affirming the richness, the diversity. It does not allow the past to be lost no matter what the present. I found companionship in this insight in the works of other artists. I also share with them the desire that research and scientific discovery will unlock the key that will allow our perception of time to remain intact while we live through its expected movement of life and death, of past and present and future.

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[1] In conjunction with the exhibit, a video interview, *The Layered World of Alzheimer's*, produced by Patricia Kane, SSJ was shown.

[2] Elie Wiesel, *The Forgotten*, New York: Summit Books, 1992, p. 13.

[3] Annie Ernaux, *A Woman's Story*, New York: Ballantine Books, 1991.

[4] The exhibit, *Helen Duke has Alzheimer's Disease*, a Photo Collage by Nicholas DeCandia was shown at the Berkshire Artisans Gallery in 1991. Another artist, Alan Gussow collaborated by creating a tape to accompany the exhibit, providing "a chatter of sound" to accompany the "visual mosaic." See *The Berkshire Eagle*, January 3, 1991 for a report of the exhibit.

[5] The booklet, *Caring and Grieving. A Mother's Story in Three Voices,* provides the narrative of their presentations at *The Politics of Caring Conference* at Emory University, Atlanta, Georgia, October 11-13, 1990.

[6] Quoted in Eleanor Rubin, *Caring and Grieving.*

Magical Stories: Blending Virtual Reality and Artificial Intelligence

Hilary McLellan

We've always had virtual worlds: virtual worlds for the imagination to enter. Stories, myths, movies. From the campfire to the silver screen, and now the computer screen. Stories are one of the most fundamental and powerful synthetic experiences available to us. Interactive stories are changing our relationship to information. And most recently, the addition of artificial intelligence techniques to virtual reality extends our ability to create interactive, enacted stories with characters that perform in powerful new ways.

Artificial intelligence researchers such as Roger Schank and John Seely Brown have increasingly focused on stories. For example, Roger Shank has extended his study of scripts for everyday events, such as placing an order in a restaurant, to cover full-blown stories. Scank has concluded that people have expectations concerning story structure, what he calls 'archetypes.'

Can you do the walk? Can you do the talk? Can you improvise? Virtual characters are increasingly able to do this with the addition of artificial intelligence techniques and powerful modeling of human (and animal) behavior. With artificial intelligence features, it's not just the content, but interaction with other characters, both real and computer-generated, that are adding to engagement and immersion.

We can think of virtual characters as a form of puppet. Puppetry is the theater of manipulated objects. Virtual characters are calling their own shots, based on the programming that's embedded in them. There are wonderful 2-D virtual puppets, including a Virtual Mark Twain and a Virtual Mario, that are controlled directly by human puppeteers --- sort of like stand up comics --- but this paper will focus on the characters in 3-D worlds.

One designer has developed a Virtual Globe Theater where virtual actors act out a scene from Romeo and Juliet. You can have any seat in the theater, even a bird's eye view. The setting is highly interactive (and historically accurate). However, the virtual actors are just going through a programmed routine; there's no interactivity or improvisation. This is a wonderful application, but there are even more 'intelligent' virtual characters.

Virtual Characters in Games

Virtual reality game designer Jonathan Waldern (1994) has theorized about --- and implemented --- software design of virtual teammates and virtual opponents that incorporate AI techniques, including fuzzy logic, neural nets, and genetic algorithms. According to Waldern, one of the primary goals of VR is to generate software constructs or 'entities' (virtual actors) with whom the participant can interact in a contextually meaningful fashion. Waldern reports that the essential characteristics of a virtual actor are: (1) They have goals and motivations, not all of which are necessarily apparent to the participant; (2) They may be observed to receive sensory input both from the virtual world and from the participant; and (3) They have the capability to learn and hence adapt to any aspect of their environment.

Waldern proposes a classification scheme for different types of virtual actors, based on what AI characteristics are emphasized: (1) V-Extras; (2) V-Agents; (3) V-Actors; (4) V-Androids; and (5) V-Experts. Each category is progressively more "intelligent" and more central to the action in the game. For example, a V-Expert is an entity that may evolve it responses to events based on observation and experience within a virtual environment.

The software implementation of Waldern's virtual actors features several AI techniques: fuzzy logic, neural nets, and genetic algorithms (Waldern, 1994). In ordinary logic, a proposition is either true or false, but with fuzzy logic, a proposition is given a probability value between zero and one. A neural net consists of a two-dimensional array of neuron elements, each of which receives an input from its neighbors when they are activated, creating a network for sending signals. This is similar to the characteristics of living organisms in terms of ability to correlate ambiguous data and ability to learn by comparing outputs to a set of known results. Genetic algorithms are a powerful evolutionary technique whereby the population of problem-solving algorithms (strings of code) are permitted to breed and mutate so that when a problem is encountered, the population is evaluated to assess the quality of the solution each algorithm offers. By employing AI techniques, Waldern (1994) explains that it should be possible to create entities that are entertaining and instructive to communicate with.

Virtual Characters in Research and Development

A group of researchers led by Norman Badler, at the Center for Human Modelling and Simulation at the University of Pennsylvania, are creating simulated characters that can reason about their environment in original ways. Taubes (1994) reports that the center's main project is a computer model designed to mimic human movement. This model is used by engineers to test computer-designed products including bulldozers, buildings, and helicopter cockpits. Scientists in the center's "synthetic-conversation group" teach the computer-simulated humans the rules of speech, facial expression, and gesture. Virtual characters like Gilbert and George can then interact with minimal human oversight, improvising based on information they have been supplied with. In one exchange between a bank teller and a customer who wants to withdraw fifty dollars when there is only three dollars in his account, the banker is able to determine that there's not enough money to make the withdrawal. Badler suggests that these characters will come to look more and more like us, behave like us, and respond to language and stimuli as we do within the confines of a 3-D virtual world (Taubes, 1994).

Virtual Characters in Art

The example of Gilbert and George models logic and human movement. what about mood and personality? Bates (1992) argues that it is not sufficient to solve for the physical dynamics and movements; one must also solve for the culture. Different cultures have very different ways of telegraphing intention and mood through body language, so ideally these will be captured.

According to Bates (1992), "Most existing research on virtual reality concerns issues close to the interface, primarily how to present an underlying simulated world in a convincing fashion. However, for virtual reality to achieve its promise as a rich and popular artisitc form, as have the novel, cinema, and television, we believe it will be necessary to explore well beyond the interface, to those issues of content and style that have made traditional media so powerful. (p. 133)"

Bates reports that almost always, television, movies, and novels include at least three other key elements besides the physical space: "First, there are living creatures, usually human, and usually embodying some intelligence and emotion. These let the viewer see the world as a place of life, purpose, and feeling. Second, there is long-term structure to the events portrayed, which is to say that some kind of story is told. The story gives intensity and meaning to the world. Finally, the world is presented in an effective, emotionally powerful style. Cinematic and narrative technique are highly developed examples of the art of presenting worlds. (p. 134)"

As Bates points out, traditionally, very little research and development in virtual reality focused upon computational models of cognitive-emotional agents, long-term dramatic structure, and presentation style --- essential features for a successful artistic medium. But this is changing.

For example, in a VR art project that research artist Brenda Laurel helped to design, inspired by Native American myths and ceremonies, VR explorers can play the role of a bird or a snake or another creature, taking on the pattern of movement and the vantage point of that animal (Frankel, 1994; Laurel, 1994). This is the PLACEHOLDER project that she developed with Rachel Strickland. PLACEHOLDER was funded by Interval Research and the Banff Center for the Arts.

According to Laurel (1994), science is a dialogue with nature. She comments, "Some patterns and rhythms can only be appreciated through analysis. Both science and art are about the natural world and the unseeable. Art deals with human nature. Making art with computers is so very hard to do because it is so cut off from nature. Virtual reality is the antithesis of this."

PLACEHOLDER is an artistic research project inspired by topography as well as Native American myths and stories. PLACEHOLDER features a virtual world that is inspired by the landscape of several locations in the vicinity of Banff National Park in Alberta, Canada. These sites include a sulphur hot spring in a natural cave, a waterfall in a canyon, and a formation of hoodoos (tall, narrow rock formations or pillars) overlooking a river. Laurel comments, "The cave was the place we began for obvious Jungian reasons." In addition to the virtual world, there is a map of the PLACEHOLDER site that looks like a Native American graphic or rock painting.

This application can accomodate two people wearing head-mounted displays (who may be physically remote). It is designed to support exploration and play. People can walk around, speak, and touch and move virtual objects within the PLACEHOLDER world.

According to Laurel, people (as well as animals) mark the spaces that constitute their home turf. The following questions were asked in conceptualizing this project: How do people mark places? How can people mark places for imaginative play? People sometimes leave marks in natural places --- pictograms, petroglyphs, grafitti, or trail signs for example. One group, the Anastazi people of the southwest marked places with rock carvings. The PLACEHOLDER project features markers -- - Placeholders. These Placeholders are in the form of voices. In PLACEHOLDER, people can leave Voicemarks - bits of spoken narrative - that can be created, listened to, and rearranged by anyone who passes through. These messages and comments within the that virtual world then serve as story starters. The virtual landscape accumulates definition through messages and storylines that participants leave along the way. The people who visit PLACEHOLDER will change it. Laurel reports that one goal of the PLACEHOLDER project is to foster new forms of narrative play.

Laurel (1994) reports that in the PLACEHOLDER project, the designers tried out different camera positions in an attempt to provide a dialogue that featured Cubist qualities and Constructivism. These were not a good match for the subject.

Realism and impressionism proved to be better matches so these artistic traditions informed and inspired the PLACEHOLDER project.

According to Laurel, immersive virtual reality systems often suffer from a design strategy featuring a "severed hand" and "severed head" syndrome --- partial avatars or representations of the user's body within the virtual world. This kind of feature affects perception; it's not really natural. So the PLACEHOLDER project attempted to address this issue. Related to this, iconic gestures of the glove --- such as pointing --- are not that good at indicating the direction of intended movement; movement of the pelvis is much better for this. Also, an interface that only includes one hand is unnatural. So any kind of VR input device should include both hands, not just one, to optimize the feeling of natural interaction. For the PLACEHOLDER project, inexpensive "grippies" were used as interface devices. These are held in both hands and users grip them to signal interactions.

The issue of embodiment --- seeing a representation of oneself or the character one is "playing" --- was a central design issue in the PLACEHOLDER project (Laurel, 1994). There is a set of animal characters --- crow, snake, spider, and fish. As Laurel explained, "Four animated spirit critters." These animals talk to you as you get closer, each with a distinctive voice. A person visiting the world may approach and assume the "character" of one of the spirit animals and thereby experience aspects of its unique visual perception, its way of moving about, and its voice. Laurel refers to this kind of character within the virtual world as "smart costumes." When you take on the smart costumes, this changes what your body can do. Your voice changes. Perception may change. For example, snakes can see infrared and PLACEHOLDER tries to model this --- the space becomes brighter. Thus the critters function as "smart costumes" that change more than the appearance of the person within. You become embodied in "smart costumes." In PLACEHOLDER, the smart costumes are mostly about audio --- since the spaces in PLACEHOLDER are dark. Explaining this darkness, Laurel (1994) emphasizes that the resolution of the head-mounted displays in VR are currently at the level of what is legally blind so that other factors like audio are very important.

To make up for limitations of visual resolution, designers must be concerned with stylistic issues. In PLACEHOLDER, the images of the animals are flat, iconic --- like the simplified, symbolic image of an animal on a rock painting or some ceremonial image. The representations of the animals are like flexible sandwich boards --- you can show gait, but not limbs. Limbs were not well defined in PLACEHOLDER (Laurel, 1994).

Related to this, the designers of the PLACEHOLDER project studied carefully how to design the movements of the "smart costumes" in response to the gestures of the person embodying the various characters. For example, how should the movement of a crow be represented? What's a flap? The designers found that when users embodying the crow flapped their arms to emulate (and initiate) the crow's movement, one flap moved the participant very far --- too far ---- that is, disproportionately far compared to what we expect from the actual flap of a bird's wings (Laurel, 1994).

Researchers at the MIT Media Lab are studying ethology, the science of animal behavior, as a basis for designing animal characters in virtual worlds (Sheridan & Zeltner, 1993). Thus, "smart costumes" may have potential in both the science and humanities curricula. Actually, the MIT researchers have produced an animated short film, Grinning Evil Death, to demonstrate their design of virtual characters based on ethology.

The 1993 Guggenheim Soho Museum exhibit, "Virtual Reality: An Emerging Medium" featured artwork by several artists, including Thomas Dolby (Teixiera, 1994). Dolby prepared a VR artwork that featured a powerful interactive audio component as well as a visual component. Dolby's "Virtual String Quartet" featured the first artwork to synchronize animated figures with three-dimensional sound so that various sounds appeared to originate from different points in space. In the "Virtual String Quartet," viewers (participants) found themselves in a rehearsal space where a string quartet played Mozart's Quartet No. 21. Moving to a different location within the rehearsal space shifted the sound so that the sounds from each instrument always appeared to eminate from that instrument. There was a further element of interactivity: You found out by tickling the violin player, he really wanted to be a bluegrass player and his playing would shift in this direction when he was "touched." Similarly, the bass player wanted to be Charles Mingus --- playing a jazz bass line. The music underlying this VR artwork was performed by The Turtle Island String Quartet (Teixiera, 1994).

Avatar Representatives

Another type of virtual character is an avatar who represents you in a virtual world. This extends the notion of virtual agents online that perform tasks such as sorting through databases to find information on specified topics. Perlin (1994) envisions this scenario: "You're at a simulated conference. You and everyone else at the conference are represented by human-like "avatars" within an immersive virtual environment. Later that day, your own personal avatar roams through a virtual shopping mall and goes into the virtual stores where you like to shop in cyberspace. The avatar reflects your look, mood, and personality (or perhaps what you would prefer people to think are your look, mood and personality) (p. 46-47)." VPL Research pioneered this kind of system with its RB2 (Reality Built for Two) where participants in a virtual meeting could playfully take on the avatar of a lobster or some other creature.

Perlin (1994) recommends that we should design these avatars so that "they have personality and a certain joie de vivre." This is a very appealing idea, although it doesn't convey the full potential of virtual characters.

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Curriculum: Managed Visual Reality

David G. Gueulette

Illusions - false mental images or conceptions which may be misinterpretations of a real appearance or may be things imagined. They may be pleasing, harmless, or even useful.

The teacher for thousands of years had been considered a magician. As medicine man, shaman, or alchemist, he or she was thought to possess powers or special knowledge to cast spells, foretell the future and alter conditions or realities. The teacher, a medium of the supernatural, could pass on the prevailing culture, myths, or reality or change these elements through certain magic so that a new reality or way of life could be brought into being, and was the master of the cultural, intellectual and spiritual schools of the tribes of antiquity.

This transcendence of the intuition of the shaman to the everyday lives of the tribe members took the form of tuition that included: rites of passage, special rituals, initiations to secret orders, sharing meaningful visual symbols or illusions of the conditions of a new reality. Tuition was also expressed through dance, music, incantations, songs and very often painted or drawn visual representations. As paintings or markings visually portrayed the actions of the hunt, for example, and were magic. Not only did these signs teach the hunter the skills of hunting, they created a "reality double". This "reality double" convinced the hunters that what happened in the visual representation would happen in real life. It developed into such a bond between the visual symbols and the psychological beliefs of the tribe members that for all practical purposes no difference existed between the pictorial representation and real-life events and situations.

Even though this association between the symbolized and the actualized was born in the psyche of prehistoric man, there is some evidence suggesting that this belief in the "reality double" persists even today. Perhaps it explains the fear still observed in some cultures of being photographed; or, accounts for modern advertising which depends heavily on consumers' notions that the visual symbols or illusions of being beautiful, sexy, having cars, and things can transcend to the everyday lives of the viewers and consumers of the Madison Avenue visual reality.

In the Middle Ages, alchemists, magicians, and teachers created visual symbols: geometric shapes, animals, and supernatural beasts and designs, that tried to portray a new reality. Their paradoxical vision of the universe had mixed, in varying proportions, elements of the physical world and the imagined characteristics of the mystical and spiritual forces of the cosmos.

The alchemists, in many ways, were prophets of our modern age. They invented the idea that base metals could be turned into gold. (This mutation is now possible through the application of nuclear physics.) They discovered that reality is not just that which is perceived with the physical senses; it is also defined by the individual's interpretation. (Physicists in the Twentieth Century would reintroduce this idea.)

Alchemists contended that there was a psychic content to all the perceptions of reality. (This notion predicted Freud's discovery of the subconscious.) Their description of the existence of the forces of good and evil, light and dark and the worldly and the cosmic is very similar to current theories on the role of the subconscious as it filters the senses and effects thoughts and behaviors.

Alchemists believed that every man is part woman and every woman part man. They often characterized both sexes as hermaphrodites. (This, hundreds of years before the physiological proof of the existence of the glandular and chromosomal explanations for both male and female components in individuals.)

They elaborated many schemes for creating Homunculus - a man in a flask. (This, the original test-tube baby.) The philosopher's stone was also their unique idea, a stone with all knowledge. (A sort of granite computer.)

Their ideas have been the basis for some modern scientific discoveries. In a sense, the new visions they foretold through highly visual symbols became conscious to the historical mind of man and a component of a new view of the universe - a new reality.

Hieronymus Bosch, (1450-1516), the Flemish painter and alchemist, taught the culture of his time the amazing possibilities of a world that is both natural and supernatural, a world filled with all wondrous things and people that are simultaneously good and evil, dark and light, metal and flesh, alive and dead. His visual representations of the universe are filled with overt and covert visual symbols of a new reality.

Johann Amos Comenius, (1592-1670), a Moravian bishop and teacher, and a contemporary of the alchemists was influenced by their paradoxical views. He created a schooling plan for vocational and spiritual training that was to be provided uniformly across classes by the state. He even wrote a text for the scheme entitled "orbis pictus." The text contained elaborate pictures of people at work referenced with numerical designations and descriptions and is very much like a modern vocational education programmed learning workbook.

Comenius shared his contemporaries' attraction to highly-charged visual symbols and their interest in altering things and people as if things and people can be rearranged, mutated or enchanted to form more useful or valuable elements of a mystical yet temporal sphere. Lead to Gold!

His plan for uniform schools with state support and direction with a curriculum for the vocational and spiritual has become accepted in many if not most countries. As Ellwood Cubberley, a classical educational historian, has noted, "The germ of almost all eighteenth and nineteenth century educational theory is to be found in his work" (1948, P. 415).

The role of the teacher changed drastically with the advent of mass schooling. As schooling came to be extended to several classes of society to promote developing political, economic and religious institutions, the teacher no longer was defined as magical, capable of prompting the tribe members to transcend their accepted reality; but, was redefined as an agent of a new institution -- the school.

At the beginning of the Twentieth Century, a set of circumstances occurred simultaneously that brought about a revival of interest in redefining reality -- a renaissance of alchemic knowledge. First, the laws of atomic physics were discovered that changed forever the notion of the nature of matter. No longer could the idea of an absolute fixed reality be assumed. In turn this prompted a new view of the world that is ordered by paradoxical rules -- rules that address microcosms and macrocosms with ever conflicting truths.

As a case in point, Niels Bohr, the Noble prize winner, reported that when measuring the things of reality, personal judgement is always required to identify and interpret a subject (Jung, p. 307). In other words, there is no absolute, no such thing as a quantifiable reality. The best a scientist can do regarding the universe is to speculate on things and processes with limited measuring devices and techniques.

At the same time these remarkable discoveries in nuclear physics were taking place, the sciences of psychology and psychiatry were born. These new fields were based on the premise that there is a part of the brain, the subconscious, that is essentially obscured, that effects thoughts and behaviors. An acceptance of the existence of the subconscious promoted the idea that there is in fact an extranatural or mystical aspect of man. Too, the acceptance of the existence of the subconscious with its unmeasurable effect on perception precluded the possibility of defining reality through perceptions and reason alone.

The physicist, Wolfgang Pauli, (Jung, p. 307) related the space-time continuum of physics to human collective conscious as both being aspects of the same reality behind appearances. In other words, the world as defined by new physics and the new fields of psychology and psychiatry have in common the same general characteristic in that they are based on the belief that there is always a reality or realities obscured behind that which is immediately observed and accepted -- layers upon layers of illusions.

The artists of the turn of the century were also trying to redefine reality or at least to understand it. They shared with the alchemists an interest in expressing symbolically their visions of new realities that were "abstract", lacking in absolutes, full of light and dark, good and evil, impressions and contradictions. This art of the time often termed "surrealist" or beyond the real, portrayed the people and objects of the world as containing various aspects -- some easily observed with commonly accepted characteristics and some hidden, only identifiable as the subjects are altered or juxtaposed with contrasting subjects or circumstances.

The paintings of Picasso, Salvador Dali, Rene Magritte, Max Ernst, Marc Chagall, and others are excellent examples of this attempt to create the "surreal" and to investigate the various aspects of people and objects by mutating and juxtaposing subjects and circumstances. So, a melting clock says something more about time and space than highly representational symbols.

Other parallel interests between the surreal artists of the Twentieth Century and alchemists of the Middle Ages are evident. The alchemist Bosch is seen in the surrealist's pictures. There are numerous examples of using symbolic representations of the mystical and magical and in many cases of attempts to explain realities through geometric shapes, mythical beasts, and supernatural designs. Artists of both eras were interested in visually deriving the spirit of things and people. This mysterious spirit was called "Mercurius" by the alchemists.

The Twentieth Century "surrealist" artists re-invented ways to define realities that moved farther and farther away from purely representational art to highly symbolic visual renditions of the universe. Interestingly, what appeared very abstract, however, proved quite similar to actual photographs of matter as revealed through microphotography.

Even though scholars of physics and psychology played a major role in altering the accepted view of reality, it was the artists, in the spirit of Hieronymus Bosch and the other alchemists, who became the new teachers. They assumed the historical role of the teacher as shaman, magician or medicine man -- the one who prompts man to transcend accepted realities.

Artists as teachers have seen art as process that could provide entry to the world of imagination, feelings, dreams, creativity and a heightened awareness of the interior and exterior aspects of the self, other people and things. They construct a totally new view of the world -- almost a reverse image of the school-defined reality. To legitimize this position, artists like Robert Kent have argued: "...we as art educators have a particularly important role to play in this attempt to balance education. In light of recent scientific findings, artists, art educators, and young children involved in art no longer need feel the slightest inhibition in resisting the myth that rationality is superior to sensitivity, or in pointing out that this myth leads to a half-brained educational product" (p. 2).

Artists' arguments for looking at the world in new ways have often been grounded in partially documented theories of the structure of the brain. The brain, as they note, consists of two hemispheres, the left and the right. The left attends to reading, writing, figuring and talking. The right, mostly ignored in contemporary instruction and thus underdeveloped, deals with nonverbal and configuration processing. In order to promote the possibility of viewing new worlds, worlds of non-linear, irrational and illogical characteristics, artists have advocated new attention to the implementation of curriculum and instruction based on art activities.

While there has been no major effort to develop art as curriculum and instruction designed to develop the abilities of the right hemisphere of the brain and the resultant specific skills in configuration and non-verbal processing, the Eastman Kodak Company, the Polaroid Corporation, and other media businesses have promoted a curriculum based on "visual literacy."

This interest in redefining literacy is shared by many artists/teachers who deem this movement a way of reinforcing their earlier concerns with the development of the right hemisphere of the brain. Being literate requires certain discrimination and interpretation skills dependent upon training in visual language. The artist/teacher's original intent i.e., providing entry to the world of imagination, dreams, creativity and the awareness of the interior and exterior aspects of the self, other people and things, is realized.

Some of these new realities, however, may be confounded by dramatic illusions. In Wilson Key's provocative book, *Subliminal Seduction*, the character of visual mass media as perpetrating a conscious and subconscious visual reality is identified. Key states, "The basis of modern media effectiveness is a language within a language -- one that communicates to each of us at a level beneath our conscious awareness, one that reaches into the uncharted mechanism of the human unconscious. This is a language based upon the human ability subliminally or subconsciously or unconsciously to perceive information. This is a language that today has actually produced the profit base for North American mass communication media. It is virtually impossible to pick up a newspaper or magazine, turn on a radio or television set, read a promotional pamphlet or the telephone book, or shop through a supermarket without having your subconscious purposely massaged by some monstrously clever artist, photographer, writer or technician" (p. 11).

Key portrays the visual mass media as creating an illusion of reality both consciously and unconsciously. He couples various theories of the subconscious with current illustrations of art and photography. Many cases of universal symbols or words being embedded in visual representations are seen in Key's examples. He cites case after case of words or symbols representing heavy themes such as sex, death, anxiety, hate and perversions being incorporated in advertising visuals in magazines and on television in such a way that they are readily perceived by the subconscious, a "reality double."

His contention that mass media, especially television, and other visual media are the paramount behavioral management elements of business and government coupled with the prospect that this control is being carried on without an individual's awareness is most menacing. And, as Key notes, "Subliminal languages are not taught in schools" (p. 11).

The prospect of a total visual curriculum for mass education engineered by centrally controlled mass media is ghastly. But, if part of such a visual curriculum is also hidden, transmitting obscured messages for subconscious perception only, the implications are monstrous indeed.

Just as there was an essential

similarity among shaman, alchemists, and modern artists, there is an association between current subliminal messages and the hidden symbols in art of the 15th and 16th centuries. Termed "Anamorphosis," the hidden messages in art and architecture of the Middle Ages gave additional or covert meanings to the visual representations. These messages were political, aesthetic, or sometimes "pornographic." Like modern subliminals they sometimes operated below the level of conscious awareness.

Illusions have been used continually through history to alter realities - sometimes for malicious ends other times for benign results. Illusions have been wondrous tools in hands of the magicians, shamans, alchemists - teachers. Today's teachers, like their magical ancestors, must rely on their own magic and symbols to offer up new realities, to evoke the visions of new worlds mindful that illusions can be paradoxical, true or false, good or evil.

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Ingredients to Successful Student Presentations: It's More Than Just a Sum of Raw Materials

H. Dan Kerns
Nial Johnson

Ingredients to Successful Student Presentations: It's more than just a sum of raw materials

Many students graduating from our colleges and universities do not have an appreciation for the importance of visuals as an effective communication tool. They have grown up in a world which has surrounded and bombarded them in a visual aura, yet they are jaded and bored by visuals.

Recognizing the decline of visual communication skills of students, several faculty members from Communication, English and Industrial Engineering got together with the Coordinator of Audio-Visual Services and discussed a concept of a team approach to teaching visual literacy to college seniors in a capstone course in Industrial Engineering. This course places students in the community with real clients with real I.E. problems. The semester long project is treated as a consulting firm. In addition to solving the client's problem, students are required to communicate their findings in a series of written progress reports and a final report; an on campus oral presentation run through and a presentation to the client. Visual literacy is stressed in the creation of presentational visuals as well as the written reports.

Over the years of refining this process (the course has been taught since 1967) a guiding philosophy has been developed and tested. This philosophy supports much of the research in our field on how learning takes place. The areas we will discuss in this paper and which make up the approach of teaching visual literacy skills are as follows:

- Students learn through faculty giving a presentation and demonstration of the various tools available;
- Students learn with hands on practice and discovery;
- Students learn in a tutorial manner and;
- Students learn through observational learning: faculty members utilizing visual mediums with well produced visuals.

These methods of learning are nothing new or earth shattering. Elementary and secondary teachers have been successfully using these techniques for years. So what can we offer to the field of visual literacy except for validation of the successfulness of this procedure? The answer is the approach and empowerment. Students will learn the importance of visual literacy only if the faculty know the importance of visual literacy. Students will visualize, create and communicate concepts in well produced oral presentations and written documents if they are taught the language necessary to do so. Further, students will develop an understanding, appreciation and knowledge of the elements which go into creating good, effective visuals. All this is true if the faculty know the importance, stress the importance and practice these same techniques. This is the key element. Much of the learning is observational. Faculty members need to have a teaching style which supports what they teach. If they want their students to be good communicators visually and orally, they need to be good communicators, regardless of the subject matter being taught. All teachers and faculty members need to be trained in the area of visual literacy and design, regardless of the discipline. It is not enough to recognize a "good presentation" from a "bad presentation." Faculty members need to know "the language" of visual literacy just as much as they need to know the English language.

The goal of this paper is to share the process that has been successful in teaching students and a limited number of faculty members to become visually literate. It's not enough to expose students to all the ingredients and tools necessary to create an effective presentation and send them off with the instructions of "Do good things, create good visuals, make a good presentation." Effective presentations are indeed more than just the sum of all the ingredients. As we all know, it takes more than a recipe to make a good cook.

Overview of the Process

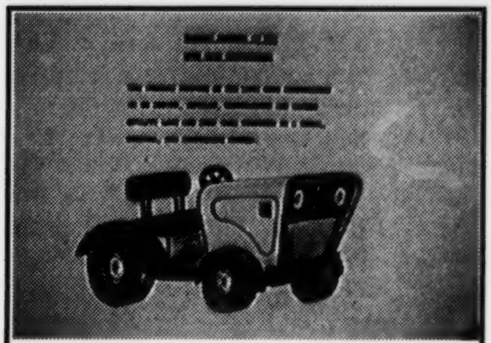
Senior I.E. students have as resources the faculty members from Communication, English and Audio-Visual who teach and assist the students in each of their content areas. Additionally students have available to them color Macintosh computers with the necessary software to create visuals and the presentation platforms such as color LCD panels and portable video projectors.

Historical Progression

Since the inception of course in 1967, there has been a steady progression and a change in the level of sophistication of the visuals. Additionally, there has been a shift in the manner in which the visuals are produced and who creates the visuals. One constant however, is a strong emphasis on the visual aspect of the presentations. The earlier slides were somewhat rudimentary in comparison to today's standards, but they were effective. There are four stages to date in the progression. The stages are defined by advances in technology. The technology has been the empowerment tool, allowing the students to become more of the creative component in the cycle. The concept of empowerment which includes the freedom to make decisions, the knowledge to make informed decisions and the necessary tools to create and implement them is an important step in the progression and will be discussed in Stage Three.

Stage One

Very early in Stage One visuals were freehand creations, type was set by a highliner and photographs. Some limited iconography was used, but the visuals largely consisted of layouts, flow charts and diagrams. Gradually the concept of visualization progressed to the point of using slides. With the introduction of computers, the highliner

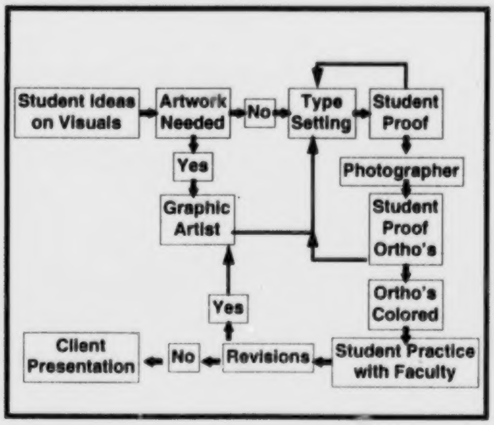


Slide 1
This slide from a presentation in 1968 and is representational of early Stage One. Notice the font size is much too small for ease of readability. The resolution of the slide was hampered by the capturing technique used to convert the slide to a computer image.

was replaced with a typesetter, but the process of creating slides was still somewhat cumbersome in that several steps were necessary in the production chain (see figure 1 below).

The students were highly dependent on professional staff in Audio-Visual to create the visuals because of the level of technology necessary to create slides. The professional staff of Audio-Visual would meet with the students and suggested visuals for their presentations. The text for each slide was created by a typesetter and the output was on photo typesetting paper. The artwork was then taken to a photographer who would shoot each page as an ortho. Once developed, the text on the slides were hand colored to delineate and highlight the header from subordinate points. If a progressive series of slides were used, each slide required additional treatment by the staff. Additionally, each new slide was hand colored so the new point in the progressive build was a different color in order to stand out.

Figure 1: Stage 1



Some limited use of iconography and line art occurred in Stage One. The artwork was hand placed on the original paste-up. The decision to use artwork had to have been made prior to going to the typesetter in that the type would be set to accommodate the placement of artwork. Originally produced artwork required longer lead time to generate than finding something in a clip art book. Company and university logos were incorporated in the slides.

The production process was lengthy and cumbersome which left little opportunity for students to make changes in their presentation after the first set of slides were created. Some changes were made in individual slides such as misspellings or coloring problems. The lead time was also lengthy. Students had to know what they wanted to include on their slides about two weeks prior to needing the visuals for the client presentation. The lead time created a problem in that much of the data analysis and recommended solutions were still in the process of being generated at the time the visuals were due to the typesetter. The material for the slides would go to the typesetter in increments, with the final recommendations being rushed through the process. Little time was available for students to

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practice with their visuals prior to the client presentation. In the coaching sessions with the faculty we could comment on the slides, offer feedback, but little could be done in the way of changing the organizational aspects of the presentation after the slides were generated.

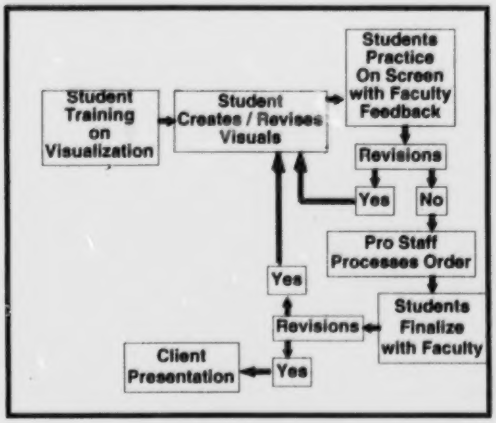
The process for Stage One was lengthy. Stress levels were high for the students and the professional staff as they toiled under the pressure of the deadline and the need for a quick turn time. Further, the slides were expensive to produce. Even if there was time to redo a set of slides, the cost was prohibitive.

Stage Two

Stage Two can be marked by the introduction of personal computers such as the Macintosh. Students begin to take on more and more of the creative process with less dependency on professional staff to create visuals (see figure two below).

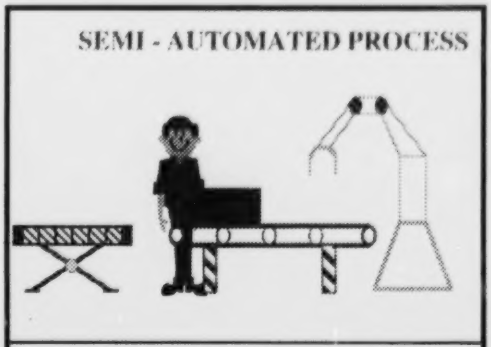
A new component is added however in that extensive training sessions are scheduled to teach visual communication skills. Empowermentis beginning to occur as students gain knowledge and independence. No longer did someone else visualize the for the students, the students did so themselves. Students were practicing what they had learned. Discovery learning also was taking place as students had their hands-on use of the equipment. They could see what the visuals would look like if they changed font styles, moved icons here or there and so forth.

Figure 2: Stage 2


Student Training on Visualization
Student Creates / Revises Visuals
Students Practice On Screen with Faculty Feedback
Revisions
Yes
No
Pro Staff Processes Order
Yes
Students Finalize with Faculty
Revisions
Client Presentation
Yes

Great strides have been made in the visualization of the slides. Iconography and placement of visuals are easily achieved in Stage Two. Flatbed scanners, clip art files and drawing applications provide an array of visual resources. A move away from highly text centered slides to visual images has occurred.

The imaging of the slides to film required about a one week lead time. This is much improved over the necessary two week lead time of Stage One. Additionally, the students can practice their presentations with the faculty using the monitor of the computer. This provided the students


SEMI - AUTOMATED PROCESS

Slide 2
Created in the mid 80's, this slide is reprepresentational of the use of iconography to communicate a message. Even without the benefit of the verbal explanation, the viewer can derive the entended meaning.

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with the added advantage of: 1. practicing with the visuals, 2. seeing what worked, 3. obtaining feedback from faculty and 4. revising visuals prior to imaging. Additionally, the concepts of visual literacy are reinforced in the practice sessions. Students can receive feedback and changes can be instantaneous.

Characteristics of Stage Two included many changes. The presentations were more professional in nature. Students were capable of producing nicely composed visuals. A variety of backgrounds were available in software packages used.

Stage Three

During Stage Three, students really began to grasp the importance of effective visuals, in which they learn the language of visual literacy and have an opportunity to practice the skills first hand. Near to total empowerment of the students occurred during this stage. Students were no longer dependent on staff to generate the visuals for their presentation (see figure 3 & 4 below).

Figure 3: Stage 3a

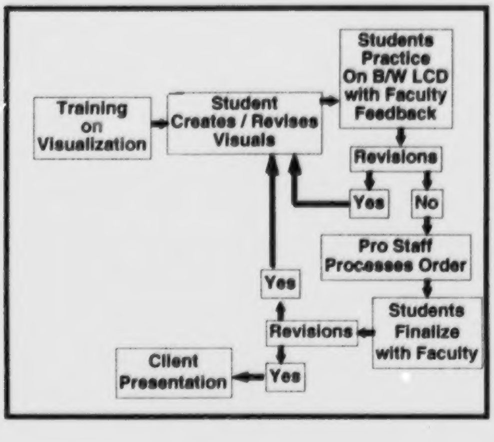
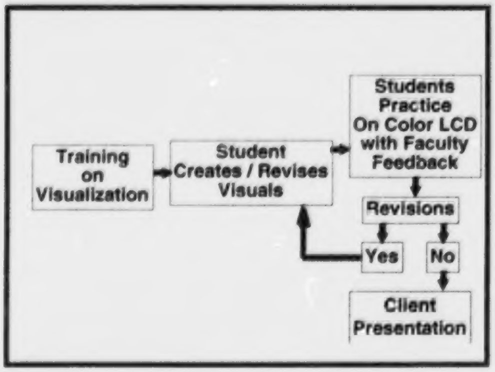
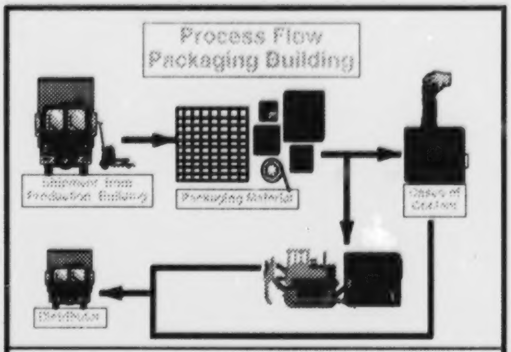

Training on Visualization
Student Creates / Revises Visuals
Students Practice On B/W LCD with Faculty Feedback
Revisions
Yes
No
Pro Staff Processes Order
Yes
Students Finalize with Faculty
Revisions
Client Presentation
Yes

Figure 4: Stage 3b


Training on Visualization
Student Creates / Revises Visuals
Students Practice On Color LCD with Faculty Feedback
Revisions
Yes
No
Client Presentation

The students could use and practice what they had learned about visuals (composition, placement, balance, color, text selection, etc.). Students now had the advantage of combining the knowledge with the available resources to create the visuals necessary for their presentation. This offered additional advantages, because the students were solidifying their abilities which would aid them in their professional development and lifelong use of visualization skills.


Process Flow
Packaging Building
Shipment from Production Building
Packaging Material

Slide 3
The empowerment process has lead to effective and creative visuals being produced by students. This visual was created in the 1994. Note the change in terminology from the use of *slide* to the use of *visual*. Visuals from Stages 3a, 3b and 4 can be imaged as a slide or projected straight from the computer through various means.

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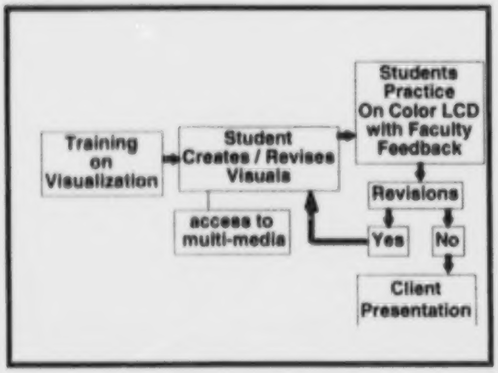
The main difference in 3A and 3B is the color data plate allows the students to bypass the imaging step, thus saving time and money. Technology affords students the opportunity to be more creative as they can change and refine their presentation up to the time of the presentation to the client if they use the data projection system. They can experiment with visuals. Less lead time is necessary for the production process, thus more time can be used on the actual production of the slides.

Stage Four

Stage four is the current stage and has much of the same characteristics of Stage Three with the added component of multi-media (see figure 5). Multi-media is different than the old use of the term, which would be more appropriate to term multiple media. For the purposes of this paper, multi-media is the intertwining of traditional formats (slides, photographs, graphics, motion sequence which includes film, video and animation, electronic still images, photo CD, computer network images and audio) into a computer controlled environment. Students now have a wide variety of inputs at their disposal for the generation of a presentation.

Figure 5: Stage 4


Training on Visualization
Student Creates / Revises Visuals
access to multi-media
Students Practice On Color LCD with Faculty Feedback
Revisions
Yes
No
Client Presentation

Empowerment becomes a question if students do not have access to the resources through lack of physical access to the necessary hardware as well as lack of knowledge of operation and/or use. If students are not equipped in either fashion, they become dependent again on professional staff and thus a setback occurs.

Empowerment

In order for total empowerment to occur, students need to have the equipment or tools available, the knowledge in how to use the tools as well as the knowledge to construct and create visuals, the time to be creative, to discover and practice what they learned in a hands-on environment, the free access to the equipment and the ability to make decisions based on facts.

There are some obvious impediments to empowerment. They can be broken down into two categories: practical limitations and system imposed limitations. The practical limitations are those things which cannot be easily changed. The lack of equipment to go around to all students, so each student's time on the equipment has to be limited, is a good example of a practical limitation. A second practical limitation would be financial or the inability to afford to keep up with technology.

System impediments are those items which we do have control over. Most center around a mind set. Many of the mind sets revolve around the stereotypical image of a librarian; that is, the only happy librarian is one who's books are all accounted for and are neatly aligned on the shelves, in perfect order and out of the hands of patrons who will only smudge the pages and dog ear the corners. This mentality is alive and well in the faculty, media centers and labs. There seems to be this need to have tight control over their equipment. Such excuses like the following: "We can't let them use it, they might break it or worse yet, they might wear it out!" "Well it would only pose a security risk!" Others use equipment as brokerage chips. The "I have something you could need, but what's in it for me?" mentality. Most often, the equipment is saved for important people: the presidents, deans, faculty chairs, people in power who can have an effective change over the media person, the lab director, etc. More often than not, when the equipment is antiquated, it is still in mint shape, waiting for the president, the dean, the ...

One of the most important items of empowerment is free access to the equipment. Students need to have access to the equipment at all hours, even weekends and for long periods of time. Many universities and schools have established strict lab hours and rules regarding use of the equipment. Creative energy flows are hard to start and hard to stop with the lab hour clock. Once a creative energy flow is interrupted (by closing time or whatever), it is nearly impossible, if not impossible, to regain the momentum which was happening at the time of the interruption. The edge is lost. The opportunity is lost. Time is lost. Labs which house the equipment necessary to use in the creative production process need to be set up so that they are flexible to accommodate empowerment.

The final mind set limitation is "It's only a student project..." Translated this means, it's only a student project and is not really worth the time, the expenditure of funds, the expenditure of staff time, the limiting of equipment availability from VIP's, etc. This mind set starts with the faculty who are not particularly creative or forward thinking. Sure it's a only student project, but the goal of which is to teach students how tc be effective communicators both orally and visually.

Other impediments to empowerment are lack of knowledge in use of the equipment as well as the knowledge of how to apply what they know about using the equipment. Sufficient training on the language and skills of visual literacy in necessary. Otherwise all the equipment and training on the equipment won't produce good visuals. This would be analogous to giving someone a hammer, some nails, lumber and a saw, showing them how to use each, and then expect them to build a house. There is more to it than that. The same is true of visualization.

Outcome

The outcome of the process has had some positive impacts in other areas at the university as well as off campus. Effective presentations are contagious. Students see friends and roommates create presentations which far exceed what they have seen before or done themselves. They are excited and curious and seek out on their own the knowledge they witnessed. They in turn use the newly found tools in their presentations after a crash course by professional staff and the discovery process. Those faculty and students become curious and the process continues. This is great, but inefficient. It is inefficient because the incidental witnesses haven't had the extensive training on proper design and use of the mediums available, but great none the less because they are availing themselves to the technology.

The same process has happened when students go to regional conferences and competitions. Students and faculty from other universities see the equipment and the outcome and often follow up the conference with a telephone call inquiry.

When students present to clients, often times the reaction of the client is amazement. They admit they are still "flipping transparencies."O n completion of the presentation by the student project team to the client, the president of the firm inquired of his staff if they had the technology to do what the students did. This has happened on three occasions in the past two years at major firms.

Faculty have witnessed other faculty member's presentations and themselves have inquired on how to go about achieving the same results for their own presentations as well as presentations required of the students. Some faculty become innovative and learn the necessary steps involved and serve as a binder to the recipe of ingredients, and are successful. Others, however, just submit a recipe card to students: "Here are the tools, the software, go create good presentations..." The end result, unfortunately isn't the same. The faculty need to empower themselves, enlighten themselves first.

Some specific outcomes of the students involved in the process are numerous. Students have a marked increase in the level of interest in creating and using visuals as well as excitement to use what they learned. They begin to take ownership of the visuals they create. They become competitive with other students in other projects over whose visuals are the best. They make time to have create visuals, often forgoing sleep, parties and weekends out. The students do not have visuals just because they are required to, they now have visuals that communicate their ideas better. This level of commitment didn't occur until students were empowered. They didn't have a tight connectiveness to the information in the visuals as they do in Stage Three and Stage Four. This is theirs. They are proud of what they have achieved. And rightly so.

Conclusion

Yes, students and much of society is jaded and bored by visuals because much of the visuals that they are exposed to aren't very good. When and only when more of society is knowledgeable and versatile in the language of visual literacy will the quality of visual information improve. And this will only happen if we in the field of visual literacy initiate change in the teaching institutions of this nation to require all teachers, all professors, all faculty members to have as a core knowledge the language of visual literacy and the ability to use it effectively. Additionally, all students should be required to take a visual literacy/media utilization course as a general education requirement. If students and faculty know the language of visual communication, this knowledge would be transferable regardless of the technology the student/faculty encounters in the future.

The process described above for the students should be applied to training of teachers and faculty. If we as a society demand and mandate our faculty to learn, create, and use visuals in their lesson plans, then the teaching institutions need to provide for them the necessary tools, the training and professionals to assist them and the time to learn through practice, refinement and discovery.

A good presentation is more than just the sum of the raw materials, it is the knowledge of *why* it is a good presentation, *what* made it so and *how* to go about doing it. And when students reach this point, they have learned the importance of visual literacy as well as the language and application, which was our goal, our guiding philosophy.

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Children's Observations About the Art in Picture Books

John Warren Stewig

Children's Observations About the Art in Picture Books

What can we learn about children's observing and responding skills, when we engage them in directed looking at the art in picture books? The exploration in classes with children reported here is a continuation of work reported elswhere, attempting to establish a foundation of information about how children respond to pictures (Stewig, 1990). This foundational data gathering is critical, since we know little of how children's visual literacy develops in classroom settings. Psychologists have explored extensively children's perceptions, that is, the physical reception of visual stimuli, in laboratory settings, as in the work reported by Houghton and Williams (1987). There is far less information available about how children observe and talk or write about art in typical classroom settings, though some programs advocate this (Duke, 1985; Eisner, n.d.). As such data become available, it should be possible to develop visual literacy programs to enhance students' ability to look at, think about, and respond to pictures.

THE CONTEXT

These data were gathered during five, forty-five minute sessions with children attending a suburban nondenominational private school. One second grade (n=17) and one fourth grade class (n=20) participated. The school curriculum provides weekly contact with an art specialist, though the program focuses primarily on producing art, with only minimal emphasis on looking at and responding to art. The school also stresses a process approach to writing instruction, which encourages children to express their ideas.

PROCEDURES

In five sessions spread over a two week period, we looked at the pictures in four versions of the Noah's Ark tale (see references). The purpose of the lessons was not to teach particular concepts about the art involved. Rather the intent was to elicit whatever children chose to describe about their observations of the books, part of the larger goal of developing in children "effective ways of talking about literature" (Jalongo, 1988, p. 90). The children made predictions about the story and the nature of the art based on their observations of the books' covers, noticed with care what the illustrator had created while listening to the story read aloud, and then in follow-up discussion made whatever comments they wished. Finally, the children's task was to choose a favorite version, and write about the reasons for their choice.

Some overall observations may clarify what happened during the sequence of lessons. To establish the order of presentation in each class, all four books were set out, and one child was asked to choose which book to use that day. By coincidence, the order of choice was identical in both classrooms.

Day One

In both 2nd and 4th grade, a child chose Hogrogian as the first book. During the introductory session, it became apparent that these children didn't perceive it important to talk about how the pictures were made (i.e., either media used or visual elements present), unless they were specifically prompted to do so. The students' comments were exclusively about content, that is, mostly plot summary, until they were asked to talk about the pictures. They did talk about the art when asked how this art looked different from that in other picture books they had seen.

When they were asked specifically about art elements, as described by Miller and Ragans (1992), they were able to talk about these, noting--for example--artists' use of color. After further discussion, one child did mention line (and gave an example of lines to show facial expression in a different book). Hobbs and Salome (1991) point out that in addition to talking about visual elements, children should be able to talk about compositional principles. When prompted about page layout, one child did notice that the picture continues across the page even though it is not continuous; that is, it is split at the gutter but it is the same picture. Children had to be prompted to encode in words where the type was on the page. They'd say left page, but didn't say bottom or top, even though that had been modeled for them.

These children often fixated on the content of pictures. For example, fourth graders talked at length about a page where, leaving the ark, the people are shown as big as trees. One child said this was the artist's way of making them important. Another commented that it's just that they are closer and the trees are farther away; he called children's attention to trees outside the window which illustrated his idea.

In each class we had long discussions about the Hogrogian title page, which is murky with few distinguishable objects. In the second grade, the children were sure this showed water that was deep, because this it was so black. In the fourth grade, children thought it was the beginning of the universe and showed God creating the world, giving the light.

Many students at both grade levels knew the story and could discuss details in it at great length. It was interesting that in neither group would any child comment verbally about Hogrogian's illustration of Adam and Eve, shown nude in an early illustration. In each class some children smiled or snickered about this the first time through. Given a choice of what pictures they wanted to talk about, none would venture to talk about that one. Ideas about what constitutes appropriate content for classroom discussion is apparently established early, albeit covertly.

Day Two

By coincidence, both children choosing this day selected the version by Fuchshuber. Again it was evident that children at this age fixate. They started talking about why one of the animal's legs were striped when the rest of its' body was solid color, and at least 10 of them had to say something about this. This discrepancy isn't in any way critical to the illustration aesthetically, or to the plot,. but several wanted to express ideas about it anyway.

One child in each class commented without any prompting on the visual distance shown in the pictures. The scenes in this book are depicted from much farther away than are those in the Hogrogian. Doonan (1993) points out that children are aware of this feature because of the varying of visual distance common in the filming of television shows. Children also commented on how far along the building process is (i.e., Hogrogian shows only the skeleton of the ark while it is nearer completion in Fuchshuber's edition). In each class, a child also commented that in the Hogrogian version, Noah is older then in this version. Someone in each class noticed that Hogrogian spreads illustrations across two pages, while Fuchshuber never does.

Day Three

On the third day, both a second and fourth grade child chose the book by Jane Ray. In each class, one child commented that Noah is black. In both classes several children noticed God's head is shown, contrasted with just His hand in the Fuchshuber version. In the second grade, children noticed that one of the pictures in the book is identical to the back of the dust jacket, but in a different size. That led to a lot of talk about variation, and particularly the difference between the word *same* and the word *similar*.

Children in the fourth grade were disturbed by what they termed the modernity of the pictures. One pointed out that the bright clothes and paint didn't seem appropriate, because people didn't have such bright colors back then. Fourth graders speculated that this book would be for younger children, as the pictures weren't realistic, and young children don't care whether pictures are real or not.

In both the second and fourth grade children wondered about mood, though that wasn't the term they used to describe it. Several children commented that the people were brightly dressed, holding hands, and there were flags on the ship. This seemed too festive for the children, and they wondered if the people didn't believe what God had said. This is an example of the way children at this age perseverate on a small detail and talk at length about something the teacher would rather move beyond.

Day Four

The last book to be chosen in each group was the one illustrated by Pauline Baynes, whose pictures accompany text from the King James version of the Bible. The vocabulary involved, and the complicated syntax, made this the most difficult text for children to process.

The text presented problems the fourth grade children wanted to discuss. They asked how all the people on earth could be descended from Noah as asserted in the text, because what would account for blacks and Asians? They wanted to know the meaning of *clean* and *unclean*.

The text presented vocabulary-related opportunities which were followed up by the classroom teacher. This version uses the word *cubit*, and as their homework, she assigned children to compare their cubit (i.e., the length of a forearm) with their parent's cubit.

The illustrations also stimulated considerable discussion. Children speculated that because the cover shows the animals leaving the ark, the author would probably get into the story more quickly than the Hogrogian version, which featured a long description of the Adam and Eve story at the beginning. Fourth graders focused on content questions, including: "Why wouldn't the crocodile have eaten the horses?" and "What if one of the animals had died during the trip, how could they reproduce?"

Some visual observations were made by children in both grade levels. In each class children wanted to know why the ark is several colors in the beginning of the story and not later. Unsolicited comments about design format throughout these sessions were rare, but in this case a second grader commented that the first word of text is enlarged.

DATA SUMMARY

In addition to this impressional overview of our discussions, it may be helpful to provide some quantification of responses. Table 1 shows the child-chosen order of presentation, and in the two right columns, the number of children who eventually chose each book as their favorite.

Table 2 shows in rank order which books were chosen.

RESPONDING IN WRITING

On the last day, all four books were displayed and children had as much time as they needed to choose a favorite and write about their choice. The books were placed in different parts of the room so there would be space for children to go to their favorite and check details as they were writing, if they wished, which in fact most children did at some time during the writing period.

Writings were collected, typed, and analyzed. Categories were not determined ahead of time, but rather emerged as similar kinds of comments, expressed differently, expressed differently, were grouped, a procedure recommended by Hudson (1986). For example, "The pictures were very clear and easy to see," "The pictures looked more like a camera took them," and "These are the boldest pictures," were all grouped together under a category labeled *style*. After this analysis, comments were tallied. Tables 3 and 4 present, in rank order, the comments children made about pictures.

Table 1: Order of Presentation		
Order of Presentation	Number of Children Choosing	
	2nd grade	4th grade
1. Hogrogian	0	1
2. Fuchshuber	10	10
3. Ray	4	6
4. Baynes	3	3

Table 2 shows in rank order which books were chosen.

Table 2: Order of Choice	
2nd grade	4th grade
1. Fuchshuber	1. Fuchshuber
2. Ray	2. Ray
3. Baynes	3. Baynes
4. No choice	4. Hogrogian

Table 3: Comments About Pictures	
Item - Grade 2	No.*
1. pictures show action	20
2. page layout	14
3. show object	12
4. style	10
5. craftsmanship	9
6. amount of color	7
7. show animals	7
8. light and dark	6
9. show people	3
10. detail	2

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*N of comments totals more than number of Ss, as in most cases several comments were made by each S.

Table 4: Comments About Pictures	
Item - Grade 4	No.
1. amount of color	17
2. detail	16
3. page layout	10
4. style	9
5. show object	9
6. show animals	9
7. pictures show action	8
8. light and dark	7
9. craftsmanship	6
10. show people	6
11. texture	1
12. size of picture	1

Tables 5 and 6 summarize comments children made about text.

Table 5: Comments about Text	
Item - Grade 2	No.
1. relation between words and pictures	7
2. style	7
3. amount of words	5
4. comprehension of	4
5. descriptiveness	4
6. amount of detail	1
7. word layout	1

Table 6: Comments About Text	
Item - Grade 4	No.
1. action told in words	10
2. relation between words and pictures	9
3. comprehension of	5
4. style	5
5. amount of detail	5
6. descriptiveness	2

Some specific comments from the children's writing show the range of their concerns.

COMMENTS ABOUT PICTURES

Grade Two

> *The pictures are good and let you fly away with them.*
>
> Laura

> *The pictures looked more like a camera took them.*
>
> Casey

> *And the pictures have a mix of pastel, markers, and watercolors. It looked so real you could jump into the pictures.*
>
> Cullen

Grade Four

> *It is very descriptive where it showed all the bad people and houses going down in the water, and the houses were all slanted in the water.*
>
> Donny

> *I think the animals are drawn well. I like the elephant best because he is drawn abstract like. He does not look real because he is cubistic.*
>
> Lucas

> *The light and shadows were excellent. Under every animal you could see their shadows.*
>
> Michael

> *My favorite is the ark when it's chopped in half and you're looking in. Every room is filled and you can see shadows from the people and animals. This was all out of depth perception.*
>
> Christopher

Katie

COMMENTS ABOUT WORDS

Grade Two

> *There were lots of words. There were also interesting words like cubits.*
>
> Cullen

> *They put the words in different places.*
>
> Brian

> *It is easy to read. I like it because it doesn't have Hebrew.*
>
> Sam

> *I like it because it didn't have a weird language.*
>
> Owen

Grade Four

> *I like the words in this book because they are written in old English, and I think they sound nice.*
>
> Sarah

> *I like this best because it has descriptive old words like thy, and creepeth.*

> *I don't exactly like old language, but for some reason I really liked this language. It was different from the rest.*
>
> Nisha

COMMENTS ABOUT RELATIONSHIPS BETWEEN WORDS AND PICTURES

Grade Two

> *The words are interesting because when it says the dove came back with*

> *a plant, the pictures even show the dove with a plant. When it says they found fresh green land the pictures even show it too.*
>
> Eric

Grade Four

> *For example, when in the words said Noah was running out of food, in the pictures he looked sad.*
>
> Meredith

CONCLUSION

It was clear from analyzing the discussions that children are indeed interested in talking about the visuals in picture books. These two groups (total N=37) talked a lot, about many different aspects of the versions of the same tale which we compared and contrasted. The type of talking they did is also revealing. Most of the comments centered on the narrative quality of the pictures, that is, relating visual information to such literary elements as plot, characterization, setting, conflict, and conclusion. Jalongo (1988) points out that children use pictures to clarify and expand text as they move from what she calls a "picture-governed" to a "text-governed" approach to constructing meaning. Doonan (1993) points out that focusing on this story-telling quality is one of three possible uses for pictures, though she argues we need to help children move to more sophisticated, aesthetic uses. Though these children did comment about such visual elements as color, shape, dimension, and texture, such comments were most often related to concerns about the narration. It is apparent that these children didn't talk often, or easily, about either visual elements or compositional devices, apart from how the artist used these to clarify or enhance the story itself. Conscious instruction in talking about visual elements and composition over a period of time might increase the number and variety in comments about visuals.

Comparing what children said in discussion with what they wrote suggests that we don't get as full a reflection of children's thinking/reacting when they write their ideas. These are bright, privileged children, and yet the discrepancy between their talking and writing, at both second and fourth grades, was striking. During the four discussion periods, children were eager to express their ideas, noticing subtle aspects of the illustrations that many adults might not notice. Yet on the fifth day, when they were to make a final choice and write about it, they got slowed down by details of enscribing. Children raised many questions; typical ones were: "Does it matter which side the holes are on?" Or, "Is this enough?" Their writing apprehension, not about ideas but about the forms of writing, was apparent, despite the schools process writing program, which does not emphasize form concerns. In general, the written products were far less skilled than was the discussion. The observations are less fully developed in writing, and do not reflect the richness of the oral talk from these fluent speakers. Clearly a more effective way to fully capture the thoughts of the children would have been to tape record and then transcribe the sessions. Nonetheless, we can learn much about how children in classrooms respond to picture books when we engage them in activities like this.

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Gender Equity & Visual Literacy: Schools Can Help Change Perceptions

Richard A. Couch

Gender equity is a very complex issue. A recent survey studied the interaction of self-esteem with education and career aspirations in adolescent girls and boys. It was conducted by Greenberg-Lake: The Analysis Group (1991) and commissioned by the American Association of University Women. The survey reflects the dramatic societal changes in the last twenty years. Most young people assume that women will combine a job outside the home with their job inside the home. Even more girls than boys think they could enter certain professions; the most common choice was law. "These changes in gender perception, and broad potential for even greater changes with a better understanding of the reciprocal relationships between schools and young women students, are among the brightest findings of the survey" (Greenberg-Lake, 1991, p.17).

However, as pointed out in a report in the *Women's Educational Equity Act Digest* (1990), girls are still significantly underrepresented in high school math and science courses. Many females never take electives or advanced courses in either field.

Statistics show that poverty is still the "female disease." In 1988, 62 percent of all people 16 years of age or older living under the poverty line were women. Women still make only 70 cents for every dollar made by men. The median income of women who work year round full time, was $17,606 in 1988; men made $26,656. Most women are working because of economic need as heads of households or in families where income is less than $15,000. Additionally, many of the gains made by women as a whole over the last two decades have not translated for women of color. Women with two barriers, gender and minority race or ethnicity face more burdens. The average African American woman makes $16,538 and the average Latina only $14,845. The unemployment rate for African-American women is 9.8%; White men, 3.9% and White women, 4.0%. (African-American men top the list at 10%.) "In the workforce, while laws have helped eliminate some barriers to women in nontraditional vocations, at the rate women are currently entering these fields, it will take between 75 and 100 years to achieve a fully integrated workforce. Most women are still found in low-status, low-paying 'pink-collar' jobs" (p. 2).

This country has already begun

to see what can happen when barriers to women are reduced: more women scientists, mathematicians, college presidents, scholars, entrepreneurs, corporate executives, politicians as well as women who are well paid blue collar workers. However, we as educators need to recognize that many of the problems that females encounter are begun and perpetuated in the schools. We must change the way we teach and the way schools operate in order to make even greater strides toward gender equity. Visual literacy is part of the change which is necessary. The remainder of this article will focus on gender equity and visual literacy.

Twenty years after educational equity was mandated in the Educational Amendment of 1972, it continues to be unresolved in the school environment. Teachers continue to have gender bias in their professional practices, teacher training has not addressed gender equity and teachers are unaware of their own biases. Gender equity has improved in the areas of textbooks and other instructional materials, however those media have to compete with the popular media including television which is constantly bombarding our senses with gender stereotypes and exploitation which perpetuate myth and bias.

Visual Literacy and Gender Equity

Two obvious connections between visual literacy and gender equity are 1) female images and the exploitation of those images in the popular media and 2) the portrayal of gender stereotypes in textbooks and children's literature. When you pick up a magazine it is evident that "sex sells" and that women's sexuality is used to sell products. The role of a woman in television's sitcoms, dramatic series and commercials is often stereotypical -- she is always pretty if not very smart or she often needs to be protected by men.

Weitzman (1972) stated that picture books significantly affect early sex role socialization because they present societal values to young children. Books show children how other boys and girls think and act. Children also find role models in books that represent what children can and should be in their lives. Teachers in Kansas and Texas were asked to list their favorite books to read aloud to children. This study revealed that these teachers read aloud twice as many books with male main characters (43%) as female main characters (21%). The most popular books included few female protagonists (15%). The images of female characters were often negative and narrowly defined. The images of boys were generally positive but were restricted to stereotypical portrayals (Smith, Greenlaw & Scott, 1987).

Nilsen (1978) pointed out five factors which contribute to the unequal treatment of females in children's picture books:

1) Male bias in career preparation and reading material.

2) Peculiarities in the English language. Confusion exists in English because man and alternate forms such as fellow, master, father, and patron are sometimes used to mean male,

exclusive of female. At other times these words may mean human -- both male and female. Because the more common meaning of man is the exclusively male meaning, it may be that when artists are asked to illustrate a book about cavemen or founding fathers, their minds are subconsciously triggered to think of them only as males. Masculine pronouns is another area where confusion abounds. There are no singular neutral pronouns similar to the plural "they", "their" and "them," except for the formal and awkward sounding "one" and "it." We have learned that when the sex is unknown, we should use "he" or "him." "Seventeen of the 98 Caldecott books feature animals as main characters, but none of these animals is female. Yet there is no real reason that such characters as Swimmy, Sylvester, Frederick, Alexander, and Frog and Toad could not have been female, except that once an author uses a masculine pronoun, the commitment by the illustrator is to follow through with male clothing and accessories" (p.257).

3) Sexist literary heritage. Since many of the Caldecott winners are based on traditional tales, this tendency to glorify the male role is especially obvious. "*Anansi the Spider* is a good example of the difference between reality and literary tradition. Gerald McDermott begins the book by introducing the spider Anansi and saying that 'He had six sons,' where, in reality, a father spider is nowhere around when new spiders are hatched (and even if he were, it is highly unlikely that his offspring would be exclusively male)" (p. 257).

4) The preponderance of male artists. In ninety-eight Caldecott winners surveyed, half the writers were female and half were male, but of the artists who illustrated the books, men outnumbered women two to one.

5) The sexuality of women's bodies. Nilsen feels that it is difficult to draw a discreet picture of the female body. Their sexual attractiveness works against their inclusion in illustrations in books where it is appropriate like books about art, health, the human body, and primitive or prehistoric peoples (Nilsen, 1978).

Is this a deliberate process to exclude women or to perpetuate gender stereotypes? Certainly not in most cases. Teachers do not intentionally perpetuate gender role stereotyping by choosing books with only male characters. Writers and artists don't deliberately exclude female characters. The question now becomes, how do we as educators change the status quo.

What can we do to improve gender equity?

With the help of parents and teachers, schools can be the focus of the necessary changes in the way we deal with gender equity. However, there are two areas where schools must begin to change: global changes and specific changes.

Global Changes in Schools to Address Gender Equity

What kind of changes are necessary to make our schools more gender equal?

- Change schools to a more cooperative rather than competitive environment.

- Confront "isms" head on. Deal with racism, sexism, bias, and stereotyping in an upfront manner. Don't accept any trace of these "isms" from students, other teachers or parents.
- Focus on equity and excellence will follow.
- Begin early. Equity in parenting and early childhood is essential.
- Be patient. The devastating effects of generations of gender bias cannot be undone immediately.
- Include both males and females in the reformation. Encourage boys to look for alternative careers as well as girls.
- Disseminate knowledge so that others can grow. Read the research on gender equity and discuss it with teachers and parents (WEEA Digest, 1991).
- Change standardized testing. Many standardized tests are biased in favor of white, middle class, male students. Use tests that truly measure a child's ability including writing samples and problem solving. We need to quit making local and national policy decisions about education based on whether the national average of SAT scores have gone up or down.
- Eliminate tracking. Tracking is the segregation of students according to career goals -- usually college prep, vocational, and others. The use of tracking pigeonholes students. Tracking may begin in grade school and once a student is in a specific track, it is very difficult to get out. Tracking also affects self concept. It affects the rigorousness of your education as well. One recent study has pointed out that tracking is often the result of socioeconomic and other factors and not the result of cognitive ability. A recent Stanford study reported in the October 1994 issue of *Teacher Magazine* found that as many as one-fifth of the white students who scored well on standardized tests and aspired to go on to college had been "misplaced" in lower-track courses. The proportion of high-ability African-American and Latino students who were not taking college prep courses in mathematics and science was more than twice that of White and Asian-American students. Many students and their parents don't even know if they are in the college prep classes or not. The disparity also exists for females.
- change or don't use visuals that contain gender bias.

Specific Changes Which Can Affect Gender Equity in the Schools and Elsewhere

- Dispel stereotypes. To address the adverse affects of stereotypical attitudes, teachers can provide examples of females in anecdotes, in math story problems, on bulletin boards and in discussions. Use girls' experiences to show that girls can be successful in mathematics and science. Counselors and parents must encourage girls to take courses in mathematics, science and technology. There are nearly twice as many technical jobs making use of mathematics, science, and technology applications as there are professional jobs that require them.
- Increase self-confidence. Females need a great deal of practice in nontraditional tasks in order to become confident in their abilities. Computer software can offer anonymous support for this kind of

remediation. Structure classes so that all children succeed. Work on equitable distribution of questions and tasks within each classroom. Work on developing in the students a sense of process rather than product. How you get to the solution is just as important as the right answer. By focusing on the process, teachers eliminate the students' fear of getting the wrong answer, a common tendency for female students.

- Use peer pressure as a positive aspect in the classroom. Find ways to make success in mathematics, science and technology a high status outcome. Create clubs and support groups for females that focus on their interests. Sports clubs have started to do this for those girls involved.
- Enhance the learning environment. Encourage cooperation. Allow girls to perform traditional male jobs and allow boys to perform traditional female jobs. Develop gender neutral games and activities. Work on the use of your language as a tool to encourage nonsexist attitudes. Choose appropriate learning materials.
- Provide female role models in person, in literature and in textbooks. Invite professional and blue collar women into class to discuss their jobs.
- Point out the relevance of what you teach especially in mathematics, science and technology. This is helpful for all students but seems to especially benefit females.
- Adjust the sense of dependency in some female students. Students need to realize that they are personally responsible for their successes and failures. When a teacher hears a student demeaning his or her own ability or escaping personal responsibility, the teacher should address the comment to help the student see their responsibility (Fear-Fenn & Kapostasy, 1992).
- Encourage female students to play with typically male toys. Allow them to play with toys which develop mathematical and spatial skills such as blocks, sand, dirt, climbing and construction type activities (Olivares & Rosenthal, 1992).
- Choose and use appropriate literature and textbooks. Is the protagonist male or female? Do the illustrations portray males as active doers and females as inactive observers? Are sex roles an integral part of the plot or characterization? Are the accomplishments of females based on appearance or relationships with males or on their own intelligence and initiative? Are females primarily subservient in this story or textbook? What effect will a book have on a girl's self-concept if it portrays boys as the only ones who perform brave deeds? How will self-image be affected if a girl does not measure up to the beauty standards of children's books? Does sexist language exist, e.g. mankind rather than humankind or forefathers rather than ancestors? Include books which portray active, adventurous females, in which female roles such as housekeeping and childcare are balanced with males taking care of the house and children. Look for books that depict females in occupations other than housekeeping. Include books which depict males in non-stereotyped roles. Balance the use of books which have male and female protagonists (Creany, 1993).
- Teach visual literacy and critical viewing. Teach children about

popular media including television and print material. Teach children how the visual images affect their attitudes and bias. Teach students to recognize the manipulation of popular media. Discuss and dispel stereotypes which appear on television and in magazines. Teach children how to recognize and reject exploitive visual information. Teach children how to be critical observers of popular culture.

Conclusions

Gender equity is not a trivial issue. Changes have taken place in the last few decades, however the following statistics indicate that there is a long road ahead in order to achieve real gender equity.

- By 1988, there were over 100,000 female doctors in the U.S., more than twice the number as in 1975.
- By 1990, women represented 40% if all executives, managers and administrators.
- In 1986, women earned 30% of the degrees in the physical sciences, mathematics, life sciences and social sciences.
- In 1985, the percentage of women earning B.S. degrees in engineering was almost 14%, compared to 0.3% in 1960.
- Women now constitute 20% of all dentists, 40% of all veterinarians, and 50% of all pharmacists.

However, women still constitute large proportions of workers in traditionally female occupations.

- In 1989, 80% of all administrative support (mostly clerical) workers were women.
- In 1989, women were only 9% of precision production, craft, and repair workers and only 7.2% of the apprentices.
- Women accounted for 45% of the workforce and will remain in the labor force almost as long as men.

We all need to be aware of the need for gender equity. It is easy to talk about but difficult to accomplish. I encourage you to become part of the solution rather than continue to perpetuate the problem of gender equity.

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Visualizing Qualitative Data in a Study of Student Interactions within a Computer Mediated Environment

Laurie F. Ruberg
D. Mike Moore

Description of Study

As electronic technology is increasingly used as medium for teaching and learning, the social context of the classroom is undergoing changes as well (Johnson-Lenz & Johnson-Lenz, 1991; Solomon, G., 1991; Wiburg, 1994). The research study described in this presentation examined how an application of network technology can affect the social context of the classroom. This paper discusses the visual organizers and graphic interfaces used to manage and report the findings from a 10-month ethnographic study of student participation and interaction in computer mediated communication (CMC) activities within the classroom. The dual settings for this study included two university classes taught at Virginia Tech: a freshman writing class and a plant science lab.

The study described in this paper focused on social psychological issues which were primarily expressed in words gathered from the discourses created from computer-based interactions, or from self-reports by students in their surveys, or from words used in the observation and reporting process. "Such data are not usually immediately accessible for analysis, but require some processing" (Miles & Huberman, 1994, p. 9). The processing of this data is itself problematic for as Atkinson (as cited in Miles & Huberman, 1994, p. 9) points out, "What may be generated as 'data' is affected by what the ethnographer can treat as 'writable' and 'readable.'" We further suggest that data is also affected by what can be treated as visible and interpretable and subsequently described in words. This report will demonstrate how different kinds of visual organizers were used and how these visuals led to meaningful comparisons and interpretations of the data which might otherwise not have been recognized.

The kind of visual organizers and graphic descriptions of data used included:

- Research Questions - semantically framed the observations and archives of raw data
- Tables - summarized survey data and narrative self-reports by participants
- Quantitative coding of raw data - enabled statistical comparisons of transcript data
- Charts/Tables - summarized quantitative data
- HyperCard stacks - categorized raw data into semantic themes
- Figures such as the message flow analysis - provided a diagram of the nature and sequence of student participation in CMC discussions
- Digital photographs - documented classroom interactions in the plant science lab
- Excerpts from the computer-based discussions - provided illustrations of student attitudes and behavior.

All of these types of visual representations of data and analysis are discussed from within the context of the CMC research study described above.

Main Issues in Focus of Study

The main focus of this study was to describe the characteristics of student interactions within a computer-mediated social environment. Specific questions that were answered in this study address the following issues:

- How do students interact on-line?
- How do they influence and regulate one another in this environment?
- Is the frequency of participation in the computer-mediated discourse equally distributed, or do some students dominate the discussion more than others?
- What relationship does frequency of participation have on influencing the outcome of the discussion?

Research Data

This is a qualitative study which looks at the student social behavior in a computer-mediated environment and as such it includes a variety of raw data not typically gathered in experimental or other quantitative research. The data gathered in this ethnographic study includes field notes from classroom observation

The participant observation was situated in a two freshman composition classes--one in the Fall of 1993 and another in the Spring 1994--and a plant science lab which was offered in the Spring semester of 1994. An additional 25 to 30 hours was spent in discussions with the freshman composition instructor or in telephone or electronic conversations with him regarding the design and implementation of the on-line exercise for the upcoming class, and an additional 780 hours was spent working as a graduate assistant working with the plant science lab design team in the development of instructional material. Field notes gathered from observation over a six-month period consisted of hand-written and/or electronic notes consisting of narrative descriptions of events observed. Graphic organizers for the field notes from these observation activities included a time line, the classroom diagrams and videotape material in the Plant Science Lab. In addition, the *HyperQual* HyperCard program provided an electronic means to summarize, categorize, stack, and sort worthwhile material identified from the hand-written notes.

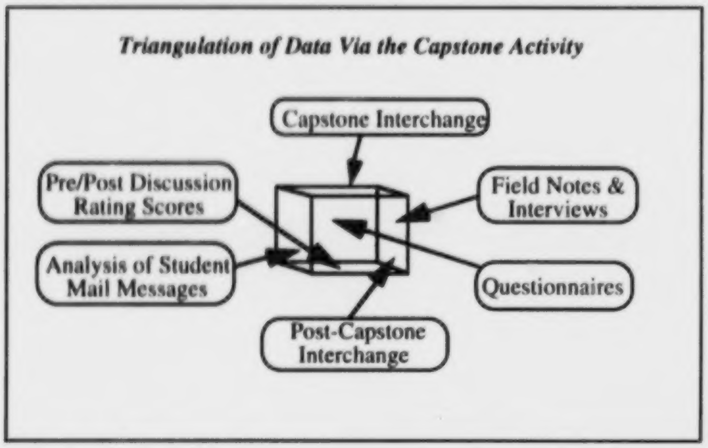

Triangulation of Data Via the Capstone Activity
Capstone Interchange
Pre/Post Discussion Rating Scores
Field Notes & Interviews
Analysis of Student Mail Messages
Questionnaires
Post-Capstone Interchange

Figure 1. Description of Capstone Data

This study also included a critical observation event in each class referred to as the *capstone activity* which provided some quantifiable data as well as electronic text archives and observation notes. Figure 1 provides a graphic summary of the multiple data sources gathered as part of the capstone activity. The data obtained from the capstone tasks included quantitative as well as qualitative information which was compared within and across classes. A variety of charts and graphs and tables comparing individual and group ratings were used to illustrate differences between students which were also noted in narrative form in the observation notes.

Both classes included initial and exit questionnaires which students completed independently, providing their answers on paper. Comparisons and analyses of student responses to these questions are presented in tables and graphs to illustrate particular areas where individual student responses differ greatly from the class mean as well as where the two classes were similar and different.

Graphical Description of Settings

A graphic map depicting the layout of the classroom for both settings was used as a tool to make notations regarding where students sat, what activities took place where, and how the physical setting related to on-line and face-to-face interactions.

Freshman Writing: The freshman writing class had 22 students and met (once a week) every other class period in a computer integrated classroom (CIC) set up by the English Department. Unlike the traditional classroom in which the teacher is the focal point of the room, the CIC is designed so that the student's individual computer screen is usually the focal point during this class. The alternate setting for this class was in a traditional classroom setting with rows of chairs all facing the teacher positioned in front of a blackboard defining the front of the room.

Plant Science Lab: A total of thirteen students completed this course which included a variety of interactions with technology. Some students shared computer workstations which were set up on top of existing lab tables. The table where most of the slicing of specimens and preparation of microscopic slides was done was located at the far end of the room. Students found that getting up and moving around the lab and doing different kinds of activities was important to break up the three-hour lab period.

Graphical Interface for Interviews/Field Observation

The field observation included notes of events that occurred during both of the classes being studied. These observations are most meaningful in the context of the date, time, and context in which they occurred, and so it is important to link data from the field notes to the time line for the project and to the underlying themes which were the focus of this study. A chronological time flow chart shown in field notes coded by date were linked to the time flow for the project. This is an important process because events occurring at an early point in the project will be interpreted with somewhat different expectations than those occurring near the end of the project.

Linking data to the underlying themes and issues being studied was more difficult. The HyperQual HyperCard program was a useful resource to make this process go more efficiently. This program is designed to electronically simulate manual methods of organizing field notes and survey data. However, it is easier to move, sort, copy, and paste narrative data that is electronic than physical material. Figure 2 shows what these cards looked like. Another benefit to using this program is that stacks can be searched and data can be regrouped according to semantic themes. These stacks can then be selectively or as a group moved out of HyperCard into a compatible word processing program.

Graphical Interface for Surveys

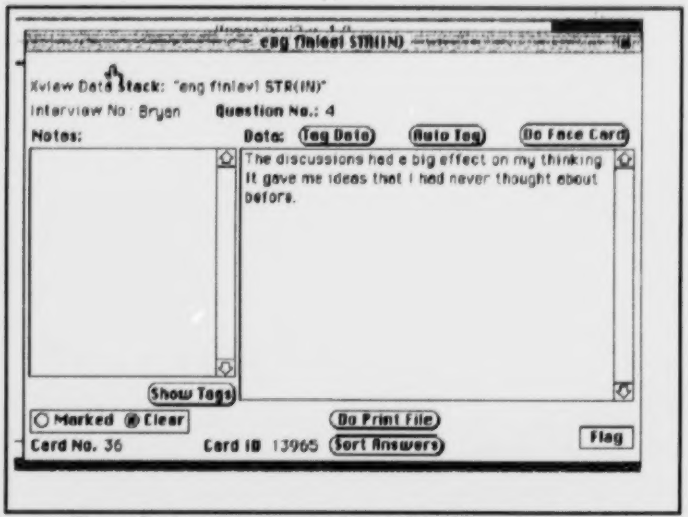
Students completed several kinds of printed questionnaires for this study. An initial list of questions was used to get a profile of each student's previous experience with computers and with participating in collaborative tasks. Many of these questions were open-ended and the kind of tables used were designed to move narrative responses from individual students to a table which could show how this response compared with others.

Graphical Interface for Videotape Material

The plant science lab class contained a lot of visual material in the computer-based instruction and in the hands-on manipulations of live plant specimens. Obtaining visual data to document student interactions with this visual material was important in this setting and much less important in the freshman writing setting. All the students in the plant science lab agreed to be videotaped for the purposes of this research study. Selected activities from nearly all the labs has been documented in videotape footage. Putting this visual information to meaningful use is challenging and extremely time consuming, and one solution to this problem has been to use selected visuals with descriptive filenames to identify where key footage is located on the tapes. This organizing system has been a useful way to get quick access to the most likely to be used visuals which were accessible to many uses and manipulations once put in digital format.

Graphical Interface to Electronic Discussions

The key source for documenting on-line interactions was through in-class discussions which occurred on-line via the *Daedalus Integrated Writing Environment*™ (Daedalus) software. The electronic text files archived from the CMC discussions represent the discourse created by student and teacher interactive writing activities, and was considered raw data until these text files were described, coded, and interpreted. Some descriptive labels have been added to each message in all the transcripts by the researcher such as: an interchange code and number indicating which interchange and what sequence in the interchange from which this excerpt was taken. The student and instructor names were changed on all the transcripts to pseudonyms to protect the identity of participants. Excerpts from interchanges presented in this document are presented in a different font to readily distinguish the electronic transcripts from this research report. Excerpts from the interchange transcripts are presented without editing. Existing spelling and grammatical errors are not typographical errors, but represent how the message appeared in the interchange.



Xview Data Stack: "eng finlevl STR(IN)"
Interview No: Bryan
Question No.: 4
Notes:
Data:
The discussions had a big effect on my thinking It gave me ideas that I had never thought about before.
○ Marked ● Clear
Card No. 36
Card ID 13965

Figure 2. A screen picture of one of the HyperQual cards.

Analysis Strategies

Analysis of these text archives involves several strategies: (1)coding the messages by content, rhetorical strategies and according to affective quality; (2) quantitative measures of participation and interaction were used and displayed to compare individual participation within a given discussion and to compare overall class participation across discussions; (3) an analysis of the pattern of message flow as developed by Levin, Kim, and Riel (1990) was used to graph the pattern of interactions in the on-line interchange.

Coding Data According to Content Description and Affective Quality. The nature of the messages sent was described

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in terms of several distinct categories which were then used for comparison and analysis. Several different coding systems were used to interpret and describe the nature of the interactions and content of the electronic transcripts. Each different coding system requires enormous amounts of time to complete the analysis of a single interchange transcript. Three different systems were used to analyze one or more transcripts. There are many other coding systems that could be used beyond the ones mentioned here, and this is not meant to be an exhaustive testing of all possibilities. Different methods of analysis have been used because each illustrates another variation on how electronic texts can be interpreted and each method looks for a different qualitative aspect of the text which the others cannot detect. The issue that emerges from this process becomes not which method of analysis is best, but which method can pull out the qualitative features of greatest relevance to this study and what features does this method overlook.

A rhetorical content coding system used by Butler (1992) was modified from a twelve to ten groups system by combining the last four categories into two as follows: (1)Question; (2) Reply; (3) Consensus Building; (4) Evaluation; (5)Topic Initiation; (6) Assertion; (7) Acknowledgment; (8) Off-Task; (9) Qualification/Definition; and (10) Clarification/Elaboration. This system describes the nature of the content of the interchange, but is limited because it does not help the researcher classify the social-emotional quality of each message.

The Bales Interaction Analyses Scale (Bales, 1950/1976) to provide a coding system which could describe the positive, negative, or neutral quality of social mediations evidenced in the text transcript. In analysis of the interchange transcripts, the Bales system for categorizing interchange transcripts provides fairly adaptable categories for coding the text messages which would account for the social-emotional quality of the message. Figure 3 illustrates how many of the messages conveyed some degree of social psychological information within the textual message.

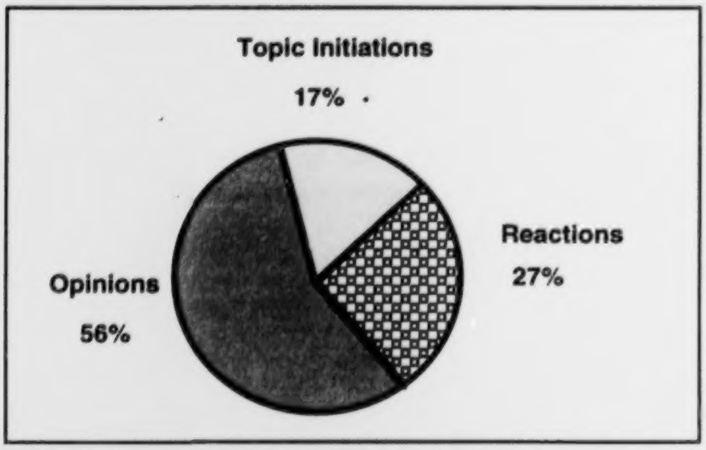

Figure 3. A comparison of the content of student on-line messages based on the Bales Interaction Analysis Scale.

Quantitative Measure of Network Connections. Descriptions of the raw data include averages, percentages, and ratios of interactions on-line. The Daedalus concordance utility program was used to count the number of words per message, words per participant per interchange, number of sentences and number of questions per interchange. Additional numeric data comes from documenting and counting the network connections associated with each interchange. This includes the number of messages sent and received in chronological order. In this class students always logged into Daedalus using their real names; pseudonyms were not used. Transcripts of interchanges were saved in chronological sequence. The level of participation in different interchanges varied depending on the topic, the amount of time students were given to be in a given interchange, and the sequence in which an interchange occurred.

Three additional quantifiable measures of individual participation include--the *participation ratio*, *participation frequency*, and *integration ratio*. These measures along with the volume ratio provide quantitative information about participant interaction and participation. The participation ratio represents the number of messages sent divided by the total number of messages. The volume ratio is similar to the participation ratio, but instead divides the number of words sent by the total number of words in the interchange. This quantitative comparison gives an indication of the relative length of a person's message. When compared with the participation ratio the volume ratio shows not just how often, but also what percent of the discourse volume is generated by a given participant.

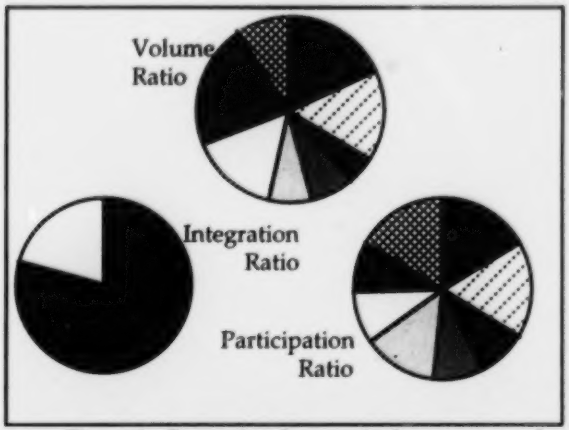

Figure 4. Comparing the quantitative measures of participation.

Message Act Analysis. The "message act analysis" developed by Levin, Kim, and Riel (1990) is based on the system for classifying instructional speech acts developed by Mehan (1950/1978) to document a common classroom interaction pattern called "IRE sequences" which involves--Initiation by teacher; Reply by student; Evaluation by teacher. When they applied Mehan's analysis system to "message acts" in electronic instructional teacher-student interactions, Levin et al. (1990, p. 206) found that "...There are substantial differences between face-to-face instruction and instruction conducted using electronic networks. However, there are also important similarities." The key difference between globally distributed electronic group interactions and face-to-face interactions is related to the nature of time. Using electronic networks to link people who are geographically distributed allows the discussion to become time-independent. However, stretching interactions over this "non-real time medium" (Levin et al., 1990, p. 210) changes the course of interactions in ways not fully understood. While the interactions are stretched out over new, unpredictable time bands, the participants are partly compensated by the multiple threads of discussions occurring simultaneously.

This study looked at in-class use of electronic discussions and avoids some of the timing problems associated with distributed electronic groups because the interchange must end at the end of the class period. The message act analysis is useful for describing the pattern of teacher-student interactions in the electronic community. Figure 5 shows how this method of analysis was used to interpret the capstone transcripts of student-peer and student-teacher interactions in the freshman writing class. Levin et al. (1990) indicate that the typical IRE sequence is spread out in the electronic communication environment--particularly when participants in distributed geographic locations are linked via electronic mail. Figure 5 illustrates the IRE sequence as it occurred in one of the capstone interchange discussions. Even here where all communications occurred within a class period, responses are spread out and are sent at different time intervals. Students continued to send their responses to the teacher's initial question while other subsequent topics for discussion were initiated.

As the illustration of the electronic message flow in Figure 5 indicates, student responses to teacher initiations dominate the discourse. The message act analysis developed and described by Levin, Kim, and Riel (1990) is a useful model for describing the sequence of interactions which can then be diagrammed to visualize the IRE sequence, but this kind of analysis did not describe the emotional quality of the messages as part of its coding system. Since this study focused on describing how students interacted with each other on-line, the Bales analysis tool was used to track the social emotional quality of the messages.

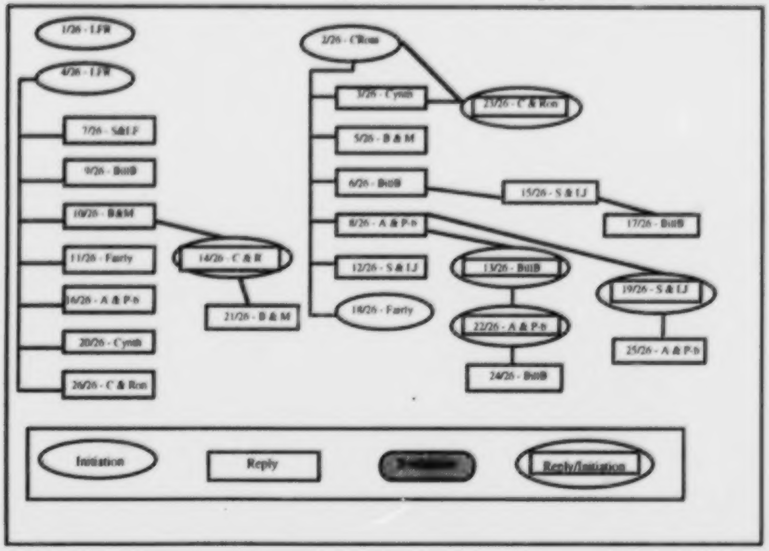

Figure 5. Message flow analysis of Plant Science Lab Capstone Interchange.

Graphics to Facilitate Interpretations & Comparisons

The Daedalus Interchange program was used for the interactive writing exercises in both the freshman writing class and the plant science lab, so students interacted with the computer via the same human-computer interface. However, the instructional goals and other in-class activities in these two classes were differed in many ways. One of the challenges with this dual setting study was to find meaningful ways to compare the interchanges between these classes.

One of the most interesting comparisons between these two classes was shown in the scatter plot which compared the percentage of questions created in two interchanges. The plant science lab tended to have more questions in each interchange, and in fact, one of the goals as expressed by the developer of this course was that students be stimulated to ask questions and learn what kind of questioning process is involved in the study of plants.

The computer-based discussion produced in lab nine was exceptionally interactive. The high level of interactivity in this discussion is visually represented in the message flow analysis of this lab which is shown in Figure 6. Students initiated the majority of questions in this discussion and students responded and followed up on each others' questions and comments more so than in other interchanges. The prior activities in this class prepared students for an active discussion which built upon a face-to-face interactions directed by the teacher during the hands-on manipulation and observation of live plants.

This interchange is a good example of how the interactive writing activities can be used to summarize and move further into topics that are discussed and/or demonstrated in other parts of the class. In no other aspect of the lab activities were all students simultaneously active participants

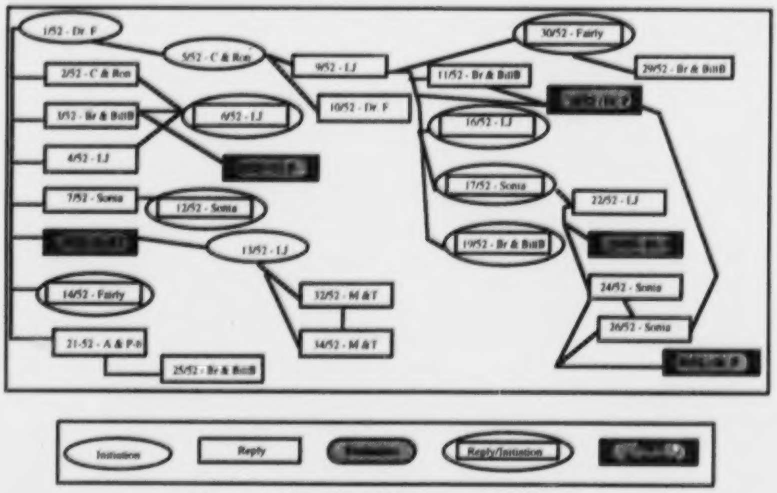
1/52 - Dr. F
5/52 - C & Ron
2/52 - C & Ron
3/52 - Br & BillB
6/52 - LJ
4/52 - LJ
7/52 - Sonia
12/52 - Sonia
13/52 - LJ
14/52 - Fairly
21-52 - A & P-h
25/52 - Br & BillB
32/52 - M &T
34/52 - M &T
9/52 - LJ
10/52 - Dr. F
11/52 - Br & BillB
30/52 - Fairly
29/52 - Br & BillB
16/52 - LJ
17/52 - Sonia
22/52 - LJ
19/52 - Br & BillB
24/52 - Sonia
26/52 - Sonia
Initiation
Reply
Reply/Initiation

Figure 6. Message flow analysis of lab 9.

generating responses and questions. For many of the students this was considered to be one of the best labs, and simultaneously, this interchange was rated as being one of the best interactive discussions for this class by both the teacher and the students. Figure 6 illustrates the pattern of interactions that occurred in this successful on-line discussion. The message flow analysis displayed graphically in Figure 6, provides a visual representation of participation and interaction and additional information which complements what is learned from close analysis of the interactive discourse.

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Exploring the Scope of Design Expression: A Visual Introduction

Robert C. Sitz

INTRODUCTION

In many ways, journalism and mass communication programs are like the new kid on the block. The use of the term "communications" in textbooks really wasn't seen until about 1964, and at that time the curriculum focus was confined to the medium of newspapers. Television was still in its beginning years and very little attention was paid to the design of alternative media such as magazines. Graphics was also a relatively new term thirty years ago, but now of course the idea of computer graphics has made "graphics" a mainstream topic.

Changes in technology have made it possible today to produce journalism textbooks on Macintosh computers in-house, as well as to make it convenient to exchange information and ideas in rapid fire fashion verbally and visually. Television and photography are entering the digital era, and research and development can only continue to improve the scope of our capabilities from design through printing. Today, journalism and mass communication departments address a wide range of topics and the term "visual communication" is used to describe course offerings as well as the organization of teachers interested in the topics of typography, photography, design, communication technology, and graphic arts. Graphic arts usually mean all of the components of visual communication, from historical letter forms to electronic, digitized photography. They include all of the printed media that provide information, opinion, and entertainment (Baird, et al., 1993).

Graphic design is often defined as the preparation, production, and retention of symbols on a permanent surface. However, television and computers have extended the idea of graphics, and provided new challenges. In some respects, the way designers create visual communication in both still and moving media is beginning to overlap. As a result, the visual communication environment is expanding rapidly. At the present time, the graphic arts industry, which includes printing, publishing, and print advertising, is the second largest industry in the United States. Consequently, the need for visual communicators and people who understand graphics and design is continuously expanding (Denton, 1992).

In addition, the importance of both television and film have grown. The aesthetic image elements -- light, space, time-motion, and sound -- and how they are used, have become a complex matter. A thorough understanding of the principles of media aesthetics and their wise use is no longer a matter of choice for the up-and-coming producer of television and film communication. It is imperative that knowledge and skill in the selection and application of aesthetic elements be learned so that ideas are translated successfully into effective messages (Zettl, 1990).

At the same time, the consumer of images is becoming increasingly sophisticated about visual communication. Much teaching has been dedicated to the elucidation of principles by which visual media may be used to misinform, distort, and manipulate. People are not as easily persuaded by elementary forms of visual deception. Viewers appear to be more resistant to the manipulations attempted by T.V. commercials, magazine advertising, political campaigns, and so on (Messaris, 1994). This means that the expectations of the consuming public are on the rise. It is therefore incumbent upon educators to continue to strive to improve the state of understanding in regard to media literacy. Thus, literacy is now also defined as the ability to appreciate, analyze and question media messages such as television commercials, printed articles and advertisements, music, and new technologies like virtual reality (Downs, 1994).

VISUAL EDUCATION

Although it has been generally stated that today's student is more visually aware because of the explosion in the popularity of television, video games, computers, and magazines, it has also been suggested by some scholars that the typical student is visually illiterate. In the preface to the book, *Seeing is Believing*, Berger (1989) states that

> "It is possible, and quite likely often the case, that our students graduate without knowing very much (if anything at all) about how images communicate and how people find meaning in them, about typefaces and graphic design, or about the difference between the film image and the television image . . . ironically, a significant number of our students hope to work in fields such as advertising, public relations -- television, or journalism -- fields where they will be involved, either directly or indirectly, with visual communication."

If what Berger and others suggest is true, it appears that one challenge is to begin to narrow the distance between student "awareness" of visuals and their appreciation for visuals. Once the students' critical/appreciative skills have been cultivated, the foundation will be laid for understanding why specific visual techniques are chosen; how they work; and perhaps how to use these techniques. The purpose of this introductory segment in a Journalism and Mass Communication Course called *Media Graphics Design* is to introduce students with modest graphics experience to the commercial scope of visual communications; to open their eyes to the potentials of design.

Specifically examined is the use of visual symbols and graphic expression at the time of the birth of the Confederate States of America in order to provide a potent historical context. Next, significant branded products utilized throughout history are discussed. The lecture series concludes with examples of architecture and environmental design that contribute to the creation of a corporate identity.

What follows is a pilot lecture series. The notes, script, and slides that accompany the script are in an ongoing state of modification. The format of each class period is dictated by the sequence of slides presented herein a classroom, but the pacing of each presentation is highly dependent upon the quality of student participation and discussion.

Due to technical and space limitations, most of the visuals that accompany the script have not been included in this paper. Most of the script can be easily visualized by the experienced consumer!

SCRIPT

The Invention of Tradition

South Carolina formally announced its secession from the United States of America in December 1860. Then Mississippi, Florida, Alabama, Georgia, Louisiana and Texas followed. These seceding states decided to unite, or as they put it, to confederate. The Confederacy soon produced a constitution, a flag, even a Declaration of Independence, modeled after the original one. Within months, a new nation complete with an array of national symbolism was born.

Throughout history, it has been shown that *rituals, symbols*, and *visual imagery* have been *invented* by nations in order to create new loyalties, obliterate old ones, mark territories, reinforce ideas, and initiate new ways of doing things. The creation of the Confederacy called for just such action. The *symbolism* they created was so powerful and attractive that much still exists. It is all memorialized and highly romanticized. Many industries have latched onto that monumental tragedy, the American Civil War (Olins, 1989).

Slide, Bank Notes: Everything the Confederacy produced emulated its admired model, the USA. CSA banknotes were about the same size, shape, and general design as those of the U.S.

Slide, Dark Blue Union - Confederate Grey: Confederate military uniforms were similar to those of the Union Army. The difference was in the coat: Union - dark blue, Confederate - grey.

Slide, Stars and Stripes: Stars and Stripes, the traditional American Flag was retained by the Union. It had profound emotional content. It was also unique in design and therefore difficult to imitate -- but the Confederacy tried more than once.

Slide, The National Flag, introduced March 1860 and The Battle Flag, introduced about the same time: Two attempts were made by the CSA to create flags to rival the stars and stripes:

The Battle Flag eventually became the prime symbol of the Confederacy. Called the Stars and Bars, it remains a popular piece of symbolism today. The "Blue and Gray," the "Stars and Bars," the tune "Dixie," all were "invented" between late 1860 and early 1861 when the war began (Olins, 1989).

Development of Branded Identity

In 1884, William Lever, the commercial genius who founded the Lever part of the Unilever Empire, had the foresight to recognize the importance of building identity. Soap was normally sold in anonymous grey colored bars. Quality varied between production batches. Lever's idea was to make the quality consistent and to make the soap distinctive. He experimented with quality then packaged it in imitation parchment. Then, he had to convince the working class housewife that soap was not a luxury but a necessity for the home.

Slide, Lever Handbook: This was accomplished through a handbook that was issued with the soap, "Sunlight Soap and How to Use It." "Sunlight" was Lever's first branded product. It is over 100 years old and is still sold in some markets.

Slide, Full Page UK Sunday Press for Lever, 1988.: Lever's second major brand was Lifeboy. Lifeboy was promoted as a disinfectant soap, the enemy of epidemics and microbes. Lux Flakes were introduced in 1899 (Olins, 1889).

Tradition in Branding

Branding became successful when technology combined with literacy and rising standards of living to create the first mass market. The thinking behind branding was simple, but very original. It was to take a household product no different, fundamentally, from any other product and endow it with special characteristics through imaginative use of name, packaging and advertising.

An obvious advantage of branding is that you can separate the idea of the company from the products it makes. Therefore each product can be aimed at a specific group of people. Once the idea of separate target audiences came about, the permutations were endless. Today, with niche marketing, the opportunities are even greater. If the brand is created carefully to appeal to a particular group, it can be imbued with highly charged symbolism for that audience (Olins, 1989). Examples of branded products that have great traditions include:

Slide, Kellogg 1956 and 1989: Note how Kellogg used to "sign" the package.

Slide, Quaker 1900: Quaker began using the branded system in 1877 when the Quaker Man became America's first registered trademark for a breakfast cereal. The Quaker Man looked much different then. He was robust and carried a scroll in his left hand bearing the word "pure".

Slide, Quaker Today: The current Quaker Man appeared in 1957.

Slide, Jim Beam: Jim Beam began making bourbon in 1795. This whiskey is distilled from corn instead of grain so it is a sweeter, lighter bodied whiskey compared to those produced from rye. In 1964, Congress declared bourbon -- named after Bourbon County, Kentucky -- a distinctive American product. It has an even more distinctive label!

Slide, Camel: Camel cigarettes were at or near the top of American cigarette sales for forty years. Introduced in 1913, the intended name was Kaiser Wilhelm cigarettes. R. J. Reynolds himself vetoed the idea and said, "I don't think we should name a product after a living man. You never can tell what the damn fool will do."

Slide, Ball: Generations of Americans are familiar with mason jars. There is no Mason Jar Company, however; the Mason name refers to the design of the jar. The jar bears the name of John L. Mason, an American glassblower who introduced it in 1858. It features a screw-on cap that made the home canning process simpler by eliminating the need to seal containers with paraffin or cork (Sexton, 1987).

Slide, Campbell: Campbell soup has been around since 1897. The red and white soup can is an icon. The Campbell Kids came along in 1904 -- a creation of Philadelphia artist Grace Grebbie Drayton. The red and white color of the label is based on Cornell College's football uniforms. The fact that the package design has been around since 1898 is a testament to its quality.

Slide, Arm & Hammer: The "Arm and Hammer" logo was originally used by Vulcan Spice Mills on spice and mustard products around the time of the American Civil War. The symbol represented the Roman god, Vulcan. The logo first appeared in 1867 on baking soda boxes (Sexton, 1987). If the product has a lot of character, it helps if the product's identity is symbolized and ritualized with a name, graphic symbol, and other elements.

All of the preceding examples were examples of brand-driven identities, but in other types of businesses -- like retailing and leisure -- the environment dominates.

Environmental Driven Identities

Slide, Harrods Department Store: Harrods Department Store and Bloomingdales in New York have vast ranges of products but there isn't anything you can't get somewhere else -- probably cheaper. It is the atmosphere that creates their identity. Look at the lavish displays!

Slide, Banks in older days: Banks in the past had very unique identities established by their architecture...

Slide, Banks without well-established identities: Without a clearly defined identity, a bank was difficult to distinguish from its neighbors.

Slide, The Citadel: Pictured is a retail development on the site of what once was the largest tire factory on the West Coast. Built in 1929, the Administration Building is a well-known landmark to passing motorists. The Citadel is a 35-acre collision of low-tech industrial businesses and Hollywood fantasy.

Slide, Architectural Graphics: What should be noted is the excellent architectural graphics (Communication Arts Design Annual 1991).

Slide, Power House Murals: Another example of architectural graphics is the Power House Murals in the lobby of Power House Place, a new office building on the edge of the railroad yard, south of the St. Louis Union Station (Communication Arts Magazine Design Annual 1990).

Slide, Fallingwater: One of the most widely reproduced houses designed by architect Frank Lloyd Wright is Fallingwater, built near Bear Run, Pennsylvania. It is an example of the brilliant exploitation of technology. The cantilever construction was allowed by the inherent strengths of steel-and-concrete construction to permit the massive overhanging slabs which complement the rugged natural setting with rectangular precision. Notice the shapes and form.

Slide, Robie House: Pictured is the Robie House built in Chicago in 1909.

Slide, Interior of Johnson Wax:
Wright developed "mushroom" pillars in the Johnson Wax Building interior in 1938. These pillars served structural as well as decorative purposes. Over a period of time, certain architectural characteristics are repeated over and over and a unique style becomes attributable to the designer or a period of time. The Johnson Wax Building represents Frank Lloyd Wright and is a corporate symbol of success (Feldman, 1992).

Slide, Exterior of Johnson Wax: Every organization has a unique personality. Everything that the company does, makes, sells, builds, writes, or displays should build up the corporate spirit and celebrate what it stands for. Explicitly controlled corporate identity can be the single most powerful influence on the corporate culture and its various publics. Identity development should begin with its products. The product should project the corporation's standards and values.

Slide, Andy Warhol "Brillo Boxes" 1964 17x17x14: If there was ever any argument about *art* and *commerce* mixing, these Brillo Boxes should put an end to the dispute. Artists and designers like to use repetitive rhythm and create themes. Andy Warhol was a pop artist who made *repetitiveness* the main theme of his work. The Brillo boxes that are pictured are actually wood blocks that were silkscreened by Warhol (Feldman, 1992).

Exhibits

One dimension of graphics that you may not have thought about is all of the designed environments for exhibitions and trade shows. Exhibits are very important events. Trade exhibits help to sell billions of dollars worth of products annually. Exhibition design is actually one of the most complex areas of practice in which graphic designers participate. This particular type of design can involve the use of virtually every kind of communication technique. Exhibits can appeal to all of the senses. Designers involved in this activity must be adept at manipulating photography, graphics, and typography. They must also be aware of architecture, interior and exterior space, traffic planning, crowd control, furnishings, lighting and acoustics, all types of audio-visual presentation and computer technology, as well as materials, construction, and installation methods.

Slide, Head Ski Company Booth: In the Head Ski Company booth, a commercial scaffolding product is adapted. Canvas in-fill panels were pulled taut with velcro applied to fabric and the structure.

Slide, Mother Earth News Booth: Some of the systems are "off-the-rack," so to speak. In other words, they are manufactured for general use (Klein, 1986). All of these are examples of environmentally driven identities.

COMMUNICATION DRIVEN IDENTITIES

Slide, Shell Oil Logos and Shell Advertisement: Products like gasoline have very little difference of their own, no real character. Ninety percent of Shell's business bears the Shell name. The reputation of Shell is symbolized by its name and visual imagery. Shell has altered the shape of its symbol to keep it up-to-date, and modified its typography and color -- but the basic idea was invented over 100 years ago. Shell has a great tradition.

Slide, Coca-Cola: This antebellum residence in Atlanta is the birthplace of Coca-Cola in 1886. At the top of the slide is the first outdoor advertisement for Coca-Cola. It's an oilcloth sign hung from the awning of Jacob's Pharmacy in Atlanta.
On the top right is a metal serving tray. From 1903-1905 opera star Lillian Nordicz was pictured. The clock shown was the first prize awarded to dealers for making their sales quotas.

On the lower right is the annual Coca-Cola calendar. The calendars depicted fashionable women enjoying a moment of refreshment.

Slide, Coke Serving Tray Artist: Early Coke advertising always depicted fashionable people enjoying life.Note the 1910 metal serving tray. These were used by the soda fountain operators for serving. This one has artwork that was painted by famous magazine illustrator Hamilton King.

Slide, Original Coca-Cola: The 6.5 ounce returnable Coca Cola bottle is a package that has attained iconographic status. Note how its elegant shape complements the universally recognized script logo. The bottle design is about 1915 and it was designed by Alex Samuelson and T. Clyde Edwards. Raymond Loewy later redesigned the bottle, making it more slender. The script logo changed from embossed lettering to white paint.

Slide, Coke Slide - Festoon's: The top item on this slide is a fan festoon, produced in 1926. These festoons adorned the back bars of soda fountains. Over 50,000 festoons in this design were distributed free of charge.

On the bottom is a large cardboard cutout. These dominated the front windows of drugstores. The displays would be changed several times per year to reflect seasonal themes.

Slide, Coke Slide - International: At the outbreak of WW II, Coca-Cola was bottled in forty-four countries. Robert

Woodruff, owner of Coke, ordered "that every man in uniform get a bottle of Coca-Cola for 5 cents, wherever he is and whatever it costs the company." (The Chronicle of Coca-Cola Since 1886).

Slide, Coke Slide - Illustrator Haddon Sundblom: As styles and slogans changed over the years, the message like the trademark, remained the same.

The famous character at the bottom is an illustration by Haddon Sundblom. This was a signature advertisement for Coca-Cola around the world ("The Chronicle of Coca-Cola Since 1886.)

Slide, Coke Imagery: Coca-Cola is a brown liquid of little intrinsic value. It is not much different from thousands of other drinks. Although 99 percent of the ingredients are known, the mystery ingredient referred to as Merchandise 7X, has defied analysis by chemists and competitors for over eighty years. But the imagery of Coke is simply huge. Its global success is a tribute to ingenuity and immense sums of money devoted to communication.
Because of its promotional skill, Coke has become synonymous with the good things in life; with fun (e.g. young, physically perfect families cavorting by the sea). Coca-Cola is the world's number one most recognized brand and it is the information techniques that have created its identity.

The Concept of Corporate Identity

In the 1950's and 1960's, the idea of corporate identity gained a foothold. Building a corporate identity requires risk and imagination.

Slide, BMW: BMW cars and motorcycles have created a unique identity. They are classy, expensive, well-made, reliable, and somewhat sporting in their overall feel. What's the difference between BMW and Mercedes?

In reality, not much. But, in terms of image there is a wide gulf. "Within Germany, BMW is perceived to be Bavarian, while Mercedes is perceived to be German!" Effectively, this means that technical shortcomings can be overlooked in BMW, but not forgiven in Mercedes. In the world as a whole, BMW is perceived to be lighter, less Teutonic, more exciting, younger, faster, and more fashionable.

Slide, BMW-Munich (Head Office, Museum) and BMW Catalogue: BMW has deliberately set out to cultivate this idea of itself. Of all the world's car producers it may be that BMW is the most image-conscious. Everything it does projects the BMW idea, from its head offices and museum in Munich, its advertising, its dealer showrooms, catalogues and manuals -- all are sleek, prosperous, clean-cut, and in good trim (Olins, 1989).

Some businesses deliberately set out to give their name such a special aura that they can sell practically anything under it. The idea of endorsed identity (a type of corporate identity) is that the individual parts of an organization can be readily identified, but each part is also seen as a part of a larger whole.

Slide, General Motors, 1950s: Historically, each Division of General Motors has retained its own elaborate visual symbolism, endorsed by the corporation. All of these cars of the

1950's had much in common, but each retained its own individuality. Engines and components were frequently shared across divisions (Olins, 1989). Despite individual identity for a particular model, these cars are generally recognized as GM automobiles.

Slide, Auto Grills: During the 1950's, American automobile designers embarked on a front-end binge that was soon followed by a tailfin "orgy." According to Feldman (1992), this was "a true example of American Baroque, the phenomenon had an industrial father and a psychological mother: the manufacturers' need for salable packages mated with the stylist's need to express his sculptural impulses."

CONCLUSION

What corporate identity means is that everything the organization does must affirm its most positive attributes. The products or services that a company sells must convey its standards and values. Through the architecture of their buildings, the engineering design of products, and the design of advertising and graphic marks -- modern organizations work hard in a composite of design decisions to unify communications. Much of what is done to create identity is visual and the effects of visual communication planning and design decisions can be powerful.

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The Role of Color in Remembering Graphically Presented Information

Peggy A. P. Pruisner

Prior knowledge of the world, language, and text provides a rich background for the adult reader. A sophisticated understanding of mature reading cuts through the controversies of emergent and early literacy, ranging from the importance of whole languge to the potential of phonics instruction, and focuses on the literacy task of processing visual information. Sticht and McDonald (1992) state that most adult readers in a literate society possess some knowledge of the functional uses of written language and of graphic devices. Awareness and use of the fundamental features of graphic displays are essential to literacy. Although a diversity of charts, lists, and categories of graphic features can be found in the literature, all recognize the feature of color. Kueppers (1992) states that because visual data consist primarily of shape data and color data, one can assume that 40% of all information perceived consists of information about color. Despite its significance as a source of information and as an aesthetic expression, students learn little about color in school. A minimum of direct instruction may include information about the color spectrum, the color circle, the laws of color mixing, and a few references to the uses of color in literature; however, instruction concerning the understanding and use of color in learning is largely missing from the curriculum of elementary and secondary schools, colleges and technical schools (Kueppers, 1982; Robinson, 1991).

This is the fourth study in a line of research to determine the impact of color on learning. These studies evolved from the researcher's concern for the increasing requirements of literacy (Venezky, 1990); among those requirements is visual literacy, the ability to understand and make visual messages (Dondis, 1973). This line of research has focused on the potential for and reluctance of educators to manipulate and interact with the features or characteristics of graphics (Sticht & McDonald, 1992) and to consider instruction aimed at developing visual literacy at all levels as essential across the curriculum (Robinson, 1991).

Research does not clearly guide instruction although a research base exists. From the noteworthy, classic studies of Dwyer and Lamberski (1982-83) has evolved a body of research based on the study of color-coded materials of the chambers of the heart. Subsequent studies have researched the effects of visual attributes on learning (Dwyer, 1978, 1987) although a limited number of graphic forms have been used. This line of research has attempted to broaden the scope of research by using a systematic color code in a unique graphic for which subjects have no prior schema (Pruisner, 1992). Additionally, the second study (Pruisner, 1993) attempted to further isolate color as applied to learning from graphics by eliminating the oral retelling of the myth used prior to the reading of the myth and accompanying the graphic in the first study. The third study (Pruisner, 1994) utilized the same color-coded plan in preparing the graphic for presentation and assessment, but the code was not explained to the students. Consequently, the color appeared as a cue rather than a code. This fourth study employed the same color-coded graphic presented as a color cue, but the color saturation was matched across the three colors. Furthermore, the target population was college-level readers.

Methodology

Statement of the problem

In response to the contemporary reader's need to interpret graphics in our broad information environment, research stresses the need for and importance of well-designed graphics (Gerber, 1985; Kostelnick, 1988; Peterson, 1983). Empirical research needs to be conducted to determine the effects of the manipulation of graphic features on reading (Hartley, 1986), graphical comprehension (Peterson, 1983; Soderston, 1983), and their application to instruction (Pearson, Roehler, Dole & Duffy, 1992).

Research Questions

The following research questions were investigated in all four studies in this line of research with changes only in reference to color coding and color cuing:

1. Is there a significant interaction among the graphic presentation type (systematically color-cued or black/white), the graphic assessment type (systematically color-cued or black/white), and the time of testing (immediate recall or delayed retention) of verbal material?

2. Is there a significant interaction between the graphic presentation type (systematically color-cued or black/white) and the graphic assessment type (systematically color-cued or black/white) when immediate recall of verbal material is tested?

3. Is there a significant interaction between the graphic presentation type (systematically color-cued or black/white) and the graphic assessment type (systematically color-cued or black/white) when delayed retention of verbal material is tested?

4. Is there a significant difference in recall of verbal material between those given a systematically color-cued graphic presentation and those given a black/white graphic presentation?

5. Is there a significant difference in retention of verbal material between those given a systematically color-cued graphic presentation and those given a black/white graphic presentation?

6. Is there a significant difference in recall of verbal material between those given a systematically color-cued graphic assessment and those given a black/white graphic assessment?

7. Is there a significant difference in retention of verbal material between those given a systematically color-cued graphic assessment and those given a black/white graphic assessment?

Research Design

An analysis of variance for repeated measures was used to test the hypotheses that significant interactions and differences would occur. The independent variables manipulated were the type of graphic presentation, the type of graphic assessment, and the time of testing. The two presentation and assessment types were systematically color-cued and black/white, and the two times of testing included immediate recall and 2-week delayed retention. The dependent variable, recall/retention on the assessment graphic, was measured by achievement, the number of characters, actions, and explanations that were remembered and recorded as stated on a graphic presentation summarizing a little-known Norse myth. To accommodate three independent variables, with two levels each, a 2x2x2 (presentation x assessment x time of testing) was used. Presentation type and assessment type were the between-subjects factors, and recall/retention was the within-subjects factor.

Subjects

The subjects, 60 college students from a small, Midwest liberal arts college, were randomly assigned to one of four treatment groups (adjusted n = 15).

Treatment Groups

The four treatment groups received the following:

1. Color-cued presentation, color-cued assessment
2. Color-cued presentation, black/white assessment
3. Black/white presentation, color-cued assessment
4. Black/white presentation, black/white assessment.

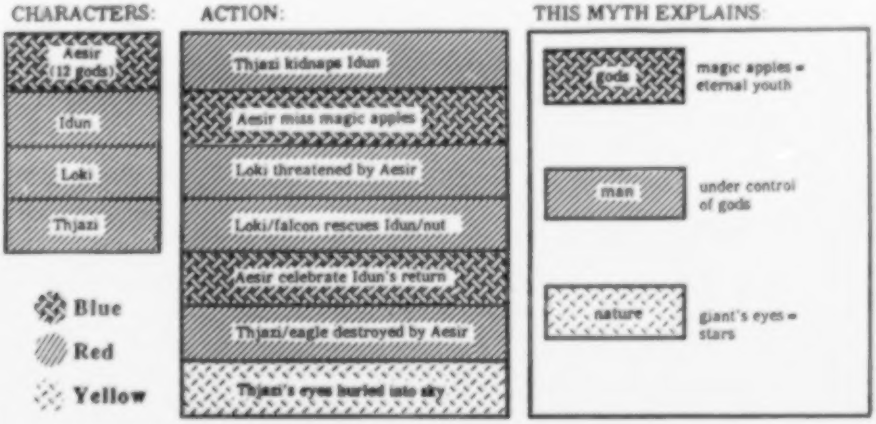
Procedure

During session one, all students received directions via audiotape; they then read and studied the graphic presentation in isolation. Subjects demonstrated both immediate recall and 2-week delayed retention on the graphic assessment without the aid of the presentation graphic.

Materials

Following the directions, subjects were given the presentation graphic. The graphic design was the same on all presentations and assessments (see Figure 1). The form of the graphic was a unique design created by the researcher to prevent the subjects from having prior experience with the graphic.

Figure 1. Sample of graphic presentation indicating the use of color.


CHARACTERS:
Aesir (12 gods)
Idun
Loki
Thjazi
Blue
Red
Yellow
ACTION:
Thjazi kidnaps Idun
Aesir miss magic apples
Loki threatened by Aesir
Loki/falcon rescues Idun/nut
Aesir celebrate Idun's return
Thjazi/eagle destroyed by Aesir
Thjazi's eyes hurled into sky
THIS MYTH EXPLAINS:
gods
magic apples = eternal youth
man
under control of gods
nature
giant's eyes = stars

Scoring of the instrument

All assessments were scored by two raters to ensure accuracy. One point was given for each acceptable word or synonym. One point was given for each box or area where all words were written in order and spelled correctly. One point was given for each word or phrase that was placed in the correct box or area.

Empirical Results

Based on the results of the analysis of variance with the level of significance established at the .05 level, there was not a significant three-way interaction among the graphic presentation and the graphic assessment and the time of testing (see Table 1). The supporting evidence, the means and standard deviations for the four treatment groups, is graphically displayed in Table 2.

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Table 1.

Repeated Measures Analysis of Variance, MANOVA Test Criteria and Exact F Statistics

	Value	F	Prob.	Sig.
Time x presentation	.99	.25	.62	NS
Time x assessment	.99	.11	.74	NS
Time x presentation x assessment	.99	.27	.61	NS

Table 2.

Mean Performance at Recall and Retention for Each Treatment Group

Group	Time of Testing			
	Recall		Retention	
	M	SD	M	SD
Color presentation				
Color assessment	73.53	(10.74)	33.13	(21.65)
Black/white assessment	69.00	(11.12)	27.67	(22.81)
Black/white presentation				
Color assessment	73.67	(5.96)	28.07	(16.23)
Black/white assessment	70.00	(10.55)	28.73	(19.28)

Note. n = 15 for each group.

Furthermore, the analysis of variance for between subjects effects did not indicate the presence of a significant two-way interaction between presentation type and graphic assessment type. No significant factors were identified (see Table 3).

Table 3.

Analysis of Variance, Tests of Hypotheses for BetweenSubjects Effects

Source of of variation	df	Sum of squares	Mean square	F	Prob.	Sig.
Presentation	1	15.41	15.41	.05	.82	NS
Assessment	1	316.88	316.88	1.03	.32	NS
Presentation x Assessment	1	91.88	91.88	.30	.59	NS

Empirically, there were no significant findings of this study: no important single factor or interaction was identified as enhancing performance.

Recommendations for Practice

In this study the use of color did not have an impact on the recall and retention of verbal information presented in graphic form. However, the notation of the color names on three of the black/white graphic assessments clearly indicates that some students use a color strategy to facilitate recall and retention. Overall, the achievement of subjects indicates they effectively use strategies or techniques to enhance performance, but the use of color as a feature of graphics does not increase recall and retention when presented as a color cue. These observations indicate the use of color in graphics should still be considered when developing curriculum, planning instruction, and designing text. The belief that a color-coding process may enable learners to retain critical information (Pettersson, 1993) needs to be further explored in both educational practice and research.

Implications for Future Research

To continue this line of research, it is recommended that future study focus on color and graphics. The results of further research would provide valuable information for readers, teachers, and designers of curricular materials at all levels of the learning spectrum:

1. Further research should investigate the effects of the use of a color code in graphically presented information when the use of the color code is explained to adult readers. The results would have an impact on the importance of direct instruction concerning the color-coding process.

2. Additional studies at varying levels should manipulate the characteristics of graphics, including new and familiar graphic presentations and different colors and numbers of colors. This should determine the comparative efficacy of varying graphic features in tapping and developing schemata.

3. Research should be conducted to investigate how skilled elementary, secondary, and adult readers use color and other features of graphics to remember patterns in schemata. This research should include quantitative, as well as qualitative research and case studies of readers of varying ages who are considered to be at an expert level. The results would have implications for the graphic schema strategies we teach.

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Associations from Pictures

Rune Pettersson

In comparison to a written text, a visual contains an infinite amount of information (Pettersson, 1985). By selecting and utilizing different parts of the information in a picture on different occasions, we can experience completely new and different perceptions when we re-see a picture in new contexts. Like other languages, pictures consist of coded messages that are comprehensible in a given social context and in a given age. For example, we often find it difficult to interpret the messages in pictures from unfamiliar cultures and ages. "Modern art" puzzles its viewers who have not yet learned to decipher the new codes. The reader (viewer) always has greater freedom in interpreting a visual message than a verbal message.

Pictures convey multiple messages. Extraneous messages may compete with the messages the sender regards as significant and important. Thus, pictures always incorporate some ambiguity and numerous "correct" interpretations, although not always a picture's intended or anticipated interpretation. The way in which a picture is interpreted depends to a great extent on the reader's code in relation to the sender's code. Studies of intended vs. perceived image content give clear evidence that there are major differences between intended and perceived image content.

In recent studies, questionnaires completed by pupils and teachers show that there are many different purposes served by the pictures that are used in schools (Pettersson, 1990). Most of these pictures can be perceived as pedagogical or cognitive in purpose, as opposed to pictures that are used to entertain, or as decoration, or in advertising and marketing. In one study made at the secondary school level, eighty-two pupils questioned mentioned 391 purposes in all, while 40 teachers named 84 purposes. Many of the answers were similar, some were even synonymous or closely related to each other. By far the most common purposes of the pictures shown in school were named as: showing, explaining, making clear, illustrating, informing, summarizing, elucidating, and conveying information.

Thus, pictures can have many purposes. This makes as great a demand upon lecturers and teachers as it does upon listeners and readers. We should always be on the alert, ready to question what the author/photographer/artist/editor means with a picture. Why is the picture there? What is its function? What is the picture's denotation (i.e., primary meaning, basic meaning, main message)? What connotations (i.e., secondary or implied meanings) does the picture have? What personal associations does the picture awake in different persons?

As far as ambiguous pictures are concerned, there is often a major difference between their *denotation,* i.e., their literal meaning, and their various *connotations,* i.e., their associative meanings, and their *private associations (*Figure 1*).*

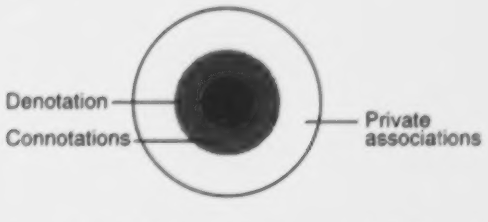

Figure 1. A picture can be interpreted in different ways by various persons. We can define fields of denotation (center), connotations (middle), and private associations (outer area).

In order to observe *the different private associations pictures awaken in people,* two studies were conducted, one of which deals with *making associations from slides* and the other with *interpreting pictures in advertisements.*

Associations from slides

During the spring term of 1991, 25 students at Stockholm University took part in the study's first field experiment. The students were told that they would be shown three slides (slides 1, 2, and 3 below), and that on viewing each slide, they should write on a separate paper *the associations* called to mind by the image content in each slide. Slide 1 was projected for 30 seconds while the students wrote their associations. After these 30 seconds, the notes were gathered up. This procedure was then repeated with the two remaining slides.

Later that year, during the autumn term, another 27 students were tested. In the second test, two pictures were replaced by others, and the pictures were only projected for 20 seconds (slides 3,4 and 5 below).

Studies of eye movements have shown that it only takes a few seconds to *recognize* a "common" image content. In other words, on both of these occasions the students were able to *view* the pictures and understand the image content, but they were given no chance to actually *analyse* and reflect on the content of each picture.

Slide 1

Test pattern from Swedish Television channel 1. The first text line reads "TV1", the second "SWEDEN".

Slide 2

Stockholm's City Hall, seen from a bridge between Riddarholmen and Södermalm on a summer's day. A few white boats can be seen contrasted against the waters of Riddarfjärden.

Slide 3

Close-up of a dead bird washed up on a sandy Japanese beach. The bird is as large as a gull, and parts of its skeleton are clearly visible. There is no trace of oil or any other potential menace; the picture does not explain how the bird died.

Slide 4

A DC-3 flying low over Riddarfjärden in Stockholm on a cloudy day in late summer. The airplane's lights are on, shining clearly against a dark cloud.

Slide 5

Musicians dressed in brightly coloured folk costumes are playing at Skansen, Stockholm's outdoor museum. It is a bright summer's day.

Table 1. Associations generated by viewing slides; the number of associations.

	Number of subjects for each slide					
Number of associations	*1*	*2*	*3a*	*3b*	*4*	*5*
1	7	2	3	7	16	16
2	5	4	5	10	7	7
3	7	6	9	6	3	4
4	3	5	4	4	1	0
5	1	5	3	0	0	0
6	0	2	1	0	0	0
7	1	1	0	0	0	0
8	1	0	0	0	0	0
m	2.8	3.7	3.1	2.3	1.6	1.6
n	25	25	25	27	27	27

For the slides viewed for 30 seconds (1, 2, 3a) the average number of associations was 3.2, and for the slides viewed for 20 seconds (3b, 4, 5) the average number of associations was 1.8.

The slides stimulated great variation in the number of associations different subjects experienced. Some subjects got only one association from a slide, such as "children's program" or "I turned on the TV too early" (slide 1), while other subjects produced long chains of associations, such as "TV - films - the news - sofa - tea and sandwiches - boring music - expectation" and "evening - film - candy - potato chips - fear - joy - loneliness - peace" (also slide 1).

In all, 385 associations were generated, 239 for the 30-second showings, 146 for the 20-second showings. In the first group, the average was 3.2 associations per person per picture. In the second group, the average was 1.8 associations per person per picture. The difference is most likely due to the viewing period being 10 seconds shorter for the second group, but as we saw above, the pictures were not the same in the two groups. For the picture viewed by both groups (slide 3), the average number of associations in the first group was 3.1, and in the second, 2.3 (significance 0.01). In some cases, several people made similar associations. Four subjects, for example, thought only of "JAS" when they saw the picture of the plane (picture 4), and three subjects thought only of "Midsummer" when they saw the musicians (picture 5). (JAS is a fighter-plane developed in Sweden.)

From a pictorial perspective, some of the words the students wrote down were actually denotations and connotations rather than associations, in as much as they directly reflect the pictures' content. It is interesting to see how words of this type, with their natural linkage to a picture's denotation or connotation, constitute the starting point for *chains of associations* in several different subjects, and thus reflect the trains of thought in the subjects being tested. On viewing slide 2, for example, eleven of the 25 students chose the word *summer*, and proceeded to generate both short and long chains of associations, all of which terminated in different ways.

Summer – taking a walk home
Summer – getting lost in a tower
Summer – long walks – school outings – dizziness
Summer – sailing – bicycling through Stockholm – morning
Summer – sun – the leaning tower of Pisa
Summer – warmth – Stockholm – vacation

Summer – lovely – grandmother – boats – the archipelago
Summer – sun – sea – Stockholm – tourism
Summer – City Hall – Stockholm – steamboat – soot on my clothes
Summer – warmth – leisure time – beautiful – Swedish
Summer – warmth – joy – Drottningholm Castle – boat – taking a walk – trains

The word summer can also be found in chains of associations that begin with other words than summer.

Sun – *summer* – Stockholm
Stockholm – *summer* – drinking coffee by the water – warm
Stockholm – *summer* – warm – tourists – the Old Town
Stockholm – City Hall – *summer* – the Swedish flag

In other words, the students have thought of the same things to some extent, but not necessarily in the same order.

Another example is the word *death*, which also led to various chains of associations.

Death – decay
Death – a cycle
Death – environmental pollution
Death – oil catastrophe
Death – a beach
Death – a beach
Death – look away
Death – a desert
Death – afraid of birds – sad
Death – the passage of life – the work of humans – disturbing
Death – the cycle of life – rot
Death – disgusting – war
Death – disgusting – oil
Death – yuck! – disgusting – but a lovely beach – oil
Death – disgusting – uncared-for – sandy beach – Gålö (Gålö is an island in the Stockholm archipelago)

Dead bird – environmental pollution – oil spills
Dead bird – sea – sand – oil – feathers
Dead bird on a beach – oil? – no, no oil on the bird – natural death

Like the word summer also the word *death* turns up later on in some chains of associations.

cadaver – *death* – rot
feathers – nature – *death* – sand
bird – feathers – nature – *death*

As could be expected, to a great degree the summer pictures awakened positive associations. Examples of this are words such as: "drinking coffee by the water", "leisure time", "lovely", "warm breezes", "my wedding", "taking a walk", "fun time", "sun", "Stockholm's festival day", and "beautiful" (slide 2); as well as "folk music", "a cabin in the country", "Midsummer", "sun", "a fiddler's hoedown", "summer in Sweden", "warmth" (slide 5). But in these contexts even negative associations came up: "one of our worst summers", "a smarmy advertisement for Stockholm" (slide 2); and "hay fever" (slide 5).

The picture of the dead bird (slide 3) produced associations that can be perceived as negative. Some of these are: "death", "putrefaction" "destruction", "cadaver", "cold sand", "war", "oil spills", "environmental pollution", "environmental catastrophe", "disturbing", "rot", "the end", "sorrow", "desolation", and "adesert". Nevertheless, this picture did call to mind a few positive associations: "lovely beach", "an archipelago", "beauty", and "warm sand".

The picture of the airplane (picture 3) was widely felt to arouse negative associations: "the second world war", "threatening clouds", "the JAS project", "crash", "war", "accident" and "ashes". However, the picture did elicit a few positive associations: "a charter trip", "trip to England" and "vacation".

Some associations can be looked on as neutral. Examples of this are: "afternoon

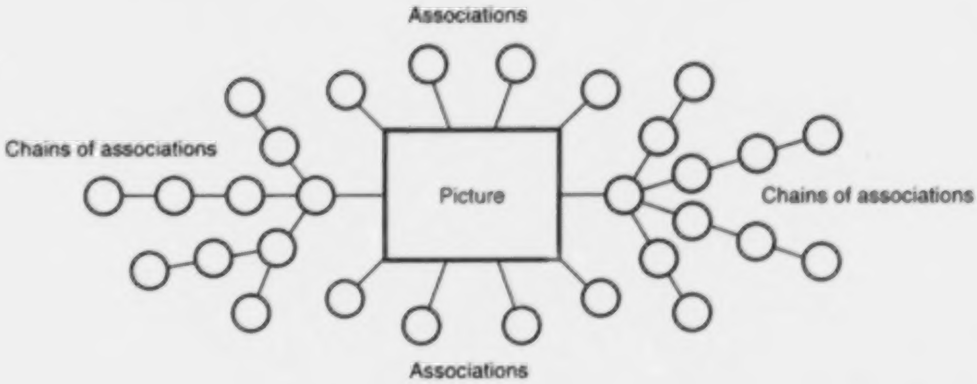

Figure 2. Any picture can arouse a great number of different private associations and chains of associations in different individuals.

educational radio", "I turned on the TV too early" (picture 1); "tourism", "boat companies" (picture 3); "Arlanda Airport" (slide 4); and "Dalecarlia" (Dalecarlia is a province in Sweden), "a cabin in the country", and "Skansen" (slide 5) (Skansen is Stockholm's rustic outdoor museum).

Clearly, it can be concluded that lecturers and teachers who use slides in their verbal presentations must realize that *pictures can generate a great variety of associations in audiences*. Therefore it is necessary that the presenters talk about pictures in an interesting way, clearly indicating what each picture means to say, so that the message communicated is in fact the intended one.

Russel (1991) has made a somewhat similar study in Australia. She was interested in finding out how individuals make sense of their world through photographs. Children (11 – 12 years old) were given black and white, and color photographs and were asked to write words and phrases which came to mind as they viewed the images. A total of 163 children responded to a picture of five Indian children photographed in a desert environment. The picture elicited more than 400 different words/ phrases (associations). On average, a total of 17 words/phrases were given by each child. Russel found that boys used words that are denotative or refer to factual elements in the photograph. Girls used more emotive words, which reflect a viewpoint of the children in the photograph.

Russel concluded that photographs can provide a unique view of life, but the meaning in the mind of the viewer is influenced by the cultural environment and background experiences of the viewer. In making sense of the world through photographs each viewer internalizes the message to personal space, time and life experiences.

Russel (1993) described five categories for viewers' contributions to photographs. The categories are observation, interpretation, personal memories, participation, and medium intrusion. *Observation*, the photograph is seen as a series of observable elements. *Interpretation*, the photograph is seen as a stimulus for interpretation. The viewer tries to create meaning from the visible elements. *Personal memories*, the photograph is seen as a stimulus to recall personal experiences. *Participation*, the photograph is seen as a stimulus for imaginative participation. The viewer is participating in the scene in the image. *Medium intrusion*, the photograph is seen as a specific communication medium related to the photograper and the camera. These categories for viewers contributions to photographs can also be found in the Swedish material.

Interpreting pictures in advertisements

Many companies, public authorities, and other organizations put a great deal of effort and money into the design and distribution of advertisements. Sometimes the text and pictures shown are redundant with respect to each other, giving the same information, or at least closely congruent information, to the observer. However, in some advertisements, we see pictures that do not represent the product or service itself, but something altogether different. Thus we ask ourselves what function these pictures have, and which associations and thoughts they awake in the observer. Are the associations that they bring to mind linked to the advertised product or service? To the company or trade mark? To the "branch" or the entire business as such? Or do they inspire completely different associations?

By way of experiment, I chose at random six advertisements from SCANORAMA, an airline magazine published by SAS, that is meant to be read by passengers on flights and in transit halls. The advertisers are all well-known companies, whose products and services are offered internationally. The advertisements chosen, which were all of full-page format, can be briefly described as follows:

Ad 1

Picture: A black sports car - Toyota - without a driver, seen at an angle from above. The car is close to the road's white line.
Text: Describes the advantages of the product.
Layout: The picture almost covers the upper half of the page. There is a line of text above the picture, and a rather long text below it.
Advertiser: Mobil Oil.
Product: Mobil 1 Fully Synthetic Lubricant.

Ad 2

Picture: A hand gloved in white holding a silver tray with a coffee pot, two cups of coffee, two silver spoons, and two flowers. Black background.
Text: Names various fine restaurants that accept Diners Club Cards.
Layout: The picture almost covers the upper half of the page. The text, white against a black background, takes up the other half of the page. In the lower right-hand corner, inserted into the body of the text, there is a picture of a Diners Club Card.
Advertiser: Diners Club International
Product: Diners Club Card.

Ad 3

Picture: Part of the foredeck, a bit of the mast and the sail of a boat in rough weather.
Text: Tells that the advertiser sponsors the world's toughest sailboat competition, "The Whitbread Round-the-World Race".
Layout: The picture covers about two-thirds of the page. In the lower right corner, inserted into the body of the text, is a picture of an open bottle of Beefeater Dry Gin and a full glass.
Advertiser: Beefeater
Product: Dry gin.

Ad 4

Picture: A man in a pilot's helmet and goggles, with wings strapped to his arms, a suitcase in each hand and a bag that he carries by holding its strap in his mouth.
Text: The airline company SAS has its own hotels in various places, and offers special service for business travelers.
Layout: The picture covers about two-thirds of the page. There is a line of text above the picture. The main text covers the lower third of the page.
Advertiser: SAS International Hotels
Product: Lodging at SAS hotels.

Ad 5

Picture: A Japanese air-hostess, kimono-clad, holding a bowl in her hands.
Text: Tells about the airline's fine service.
Layout: There is text both above and below the picture, which covers a bit more than half the page. In the lower right-hand corner, there is a small picture of a plane partially inserted into the large picture.
Advertiser: All-Nippon Airways, ANA
Product: Air travel.

Ad 6

Picture: The face, throat and shoulders of a young woman.
Text: "Giorgio Armani Parfums", the name of the advertiser.
Layout: The picture covers the whole page. In the lower right-hand corner, a picture of a perfume bottle is inserted. The short text is inside the smaller picture.
Advertiser: Giorgio Armani Parfums. (The name "Armani" is on the perfume bottle.)
Product: Perfume.

The six main pictures were cut out, pasted on white paper and numbered randomly. Two of the pictures (5 and 6) were clipped so that no trade marks could be seen. In a field study in the spring of 1990, 50 students at Stockholm University took part. The participants were told that the pictures were clipped from advertisements for products made by well-known international companies. They were also told that the advertisements had been published in an airline's magazine, but they were not told the names of either the airline or the magazine. The students got to study each picture for *as long as they needed* – usually a half-minute at the most – to decide what company they thought it represented. Then they were asked to write down the type of product and the company or trade mark that they believed the advertisement was meant to promote. The students were also asked whether they had seen the pictures before.

The results showed that only a few of the students tested had ever seen some pictures before (5 occasions out of 300), and since they were so very few, the material includes them as well. Only a few of the students associated the "right" picture with the "right" product and the "right" company. Four of the six pictures caused all the students to associate them with the "wrong" products. In one case (ad 6), two of the students (4%) associated a picture with the right product, and in another case (ad 5), thirteen students (26%) named the right product. However, only incorrect companies were associated with five of the six pictures. Six students (12%) associated one picture (ad 4) with the right company.

As shown in table 2, one picture (ad 5) produced 17 different suggestions as to what the product might be. As for companies, another picture (ad 2) elicited 15 different suggestions. Thus it is very obvious that the pictures seldom gave rise to associations that were directly linked to the advertised product or service, or to the

Table 2. Associations between advertisement pictures and products or companies.

Advertisment	Product			Company		
	Right	Wrong	Answers	Right	Wrong	Answers
1	0	100	5	0	100	5
2	0	100	6	0	100	15
3	0	100	16	0	100	14
4	0	100	8	12	88	9
5	26	74	17	0	100	10
6	4	96	11	0	100	13

In this table, "right" indicates the percentage of correct answers with regard to the product or the company. "Wrong" indicates the percentage of answers in which the product or company named was incorrect. "Answers" indicates the actual number of different answers regarding products and companies given (not persons who answered) including the alternative "Don't know". The number of subjects were 50.

advertising company or trade mark. On the other hand, they did produce associations linked to the "branch", or to similar products or operations. Generally speaking, however, the pictures awakened quite disparate associations.

In reaction to the advertisement for "Beefeater Dry Gin" (Ad 3), the product was guessed to be the following 16 products (number of persons in parenteses): Beer (10), spirits (3), sailboats (3), after-shave lotion (3), a soft drink (2), a boat (2), a trip (2), clothing (2), boat accessories (1), whiskey (1), "use a life-preserver" (1), a bank (1), tarpaulins (1), chewing-gum (1), and oil (1). Furthermore, quite a few students (16) had no idea what the product could be. As for guessing the company or trade mark, the test group came up with several names, but not the right one.

The advertisement for "Georgio Armani Parfums" (ad 6), produced the following eleven suggestions as to what the product could be (number of persons in parentheses): Cosmetics (20), make-up (11), skin lotion (6), beauty products (5), tea (3), clothing (3), perfume (2), hair-care products (2), air journey (1), food (1), and a few subjects (3) had no answer at all. As for guessing the company name or trade mark, here again names were suggested, but not the right one.

It can be concluded then, as in earlier studies (Pettersson, 1985, 1986, 1988, and 1989), that pictures can always be interpreted in a number of different ways. Yet it cannot be said that the pictures in these advertisements were inappropriate to the products they were meant to promote. In the contexts in which they appear, i.e., magazines, billboards, etc., the pictures are shown together with the texts, and *it is the texts that to some degree determine or revise our understanding of the pictures.* It is not very likely that the average observer questions whether a certain picture would suit another product better than the one it advertises. Obviously, the picture's function is not to sell the product in a direct manner, but rather to stimulate the observer's interest in the advertisement as such, thereby enticing him to read the verbal message and thus absorbing information about the product as well as the advertiser.

Conclusions

The first study showed that pictures can generate a great variety of associations in audiences. Thus, it may be concluded that pictures used in information and instructional materials always should have captions to guide the understanding of the content.

The second study showed that pictures can always be interpreted in a number of different ways, and that it is the texts that to some degree determine or revise our understanding of the pictures.

We know from earlier studies (Pettersson, 1985) that, as far as words and pictures are concerned, there is often considerable disparity between the sender's "intended message" and the receiver's "perceived message". Indeed, it is sometimes doubtful whether the receiver has understood anything at all of what the sender wants to convey. Listeners and readers create their own associations and chains of associations (Figure 2). However, one way of diminishing the gap between the sender's intention with a picture and the receiver's understanding of it, is to present the picture with interesting verbal comments and/or explanatory texts that can actively "confirm" the intended interpretations (Pettersson, 1993; Melin and Pettersson, 1991).

All the same, it is not sufficient merely to choose good pictures and see to it that they have adequate explanations. To provide readers and listeners with real help in interpreting pictures in AV material, student handbooks and other teaching aids, lecturers and teachers should be given proper guidance, for example, special instruction in pictorial presentation, the aim of which should be to enable them:

- To explain the purpose of each individual picture.
- To supplement the text by telling what the picture shows.
- To give various examples of how each picture can be used in the classroom, i.e., what is important enough to bear discussion? What tasks can be assigned in connection with a given picture?
- To provide, where necessary, supplementary facts about each picture, for example, how the picture was produced.
- To name and discuss the photographer, or artist or other producer of the pictures shown.

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Toward a New Theory for Selecting Instructional Visuals

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Introduction

The value of using images in memory tasks has been written about since the early Greeks. Similarly, the finding that memory for pictures is superior to memory for words, (Shepard 1967) has been so consistent that it has been called the "picture superiority effect" (Levie, 1987). In applied settings however, studies involving visuals have often been plagued by those problems which characterized most early media studies: weak conceptualization and poor research design.

In terms of weak conceptualization, Clark's (1983) seemly straightforward criticisms of the "media against media" or mediated versus "traditional" instruction have been surprisingly controversial and much discussed. These arguments notwithstanding, such studies were not grounded in theory and are probably best construed as evaluations, (Moore, Myers, & Burton, 1994). As such, they provided no theoretical information ("this works as good as, or better than, this"). The second problem, that of poor research designs, has been covered in depth by, for example Dwyer (1978), and involves the omission of experimental controls, non-equivalent conditions, etc. While the storage of images *per se* in memory remains controversial, a few notions about images and visuals are generally agreed upon in the cognitive psychology literature.

In whatever manner images are stored, our memory for visuals is not very exact. Images contain information encoded after perceptual processing has taken place. As a result they tend to be generalizations or the gestalt of visuals (Klatzky, 1980) which have been reorganized to "fit" (Anderson, 1978). Furthermore, as with any item in long-term storage, memory for visuals is subject to distortions and forgetting (Miller & Burton, 1994). Visual processing takes place in the same limited system as that for all other stimuli. The system can only process a fraction of those stimuli that bombard it at any one time, and consequently our processing of visuals is limited (Kosslyn, 1975).

The two currently accepted cognitive theories describing the processing of visuals are dual coding theory and cue summation theory. Dual coding theory (Paivio, 1971,

1986) is the notion that concrete sensory stimuli which can be verbalized, *will* be verbalized. Concrete words which can be imaged, *may* be imaged. Thus visuals are decoded into words automatically and stored in *two* channels. This is the most popular explanation for visuals tending to be more effective than words.

Cue summation has been the driving theory behind the bulk of the research in the effort to explain why some visuals work better than others. In its simplest form, what Dwyer (1978) has called "realism," this theory predicts that "learning will be more complete as the number of cues in the learning situation increases.... An increase in realism... increases the probability learning will be facilitated" (p. 6). Unfortunately, Dwyer's review of some 50 studies found that increasing the number of cues (adding realism) often *decreased* learning.

Miller (1957) had, in fact, allowed for just such an occurrence (albeit in a behavioral, rather than cognitive framework).

> When cues...within the same modality are used simultaneously, they may either facilitate or interfere with each other. When cues elicit the same responses simultaneously...they should summate to yield increased effectiveness. When the cues elicit incompatible responses, they should provide conflict and interference (Miller 1957, p. 78).

The problem, of course, is determining which cues will summate and which will produce conflict and interference. Severin (1967), also agreed that learning would be increased as the number of cues, particularly visual cues, increased. Severin added to the above sentiments by emphasizing that the cues added had to be *relevant* ones. Hsia (1968, 1971) expanded on this by stating that they not only had to be relevant, they had to be *redundant*. If "more is better" works only some of the time, then how to decide more (or less) of what? How to decide what is relevant? Concept attainment theory, as described by Bruner, Goodnow, and Austin (1956) offers a basis for selecting which cues are relevant for any learning task which includes a component of identification and recognition.

Concept Attainment Theory

Bruner, Goodnow and Austin(1956) describe the definitive efforts in a formal description of *concept attainment*, which they define as

> ...the process of defining attributes that distinguish exemplars from non-exemplars of the class one seeks to discriminate. (p. 22)

An attribute is "any discriminable feature of an event that is susceptible of some variation from event to event"(p. 26). In other words, if the feature is constant between classes, it is not a meaningful attribute for the task at hand. Concept attainment is learning which involves categorizing items based on some of their features.

The manner in which individuals learn a concept—the strategy used—is influenced by a variety of factors, including (but not limited to) the nature of the task, the type of feedback received, and the time available for learning. Strategy choices in turn affect the time required for accurate concept attainment. Bruner, Goodnow, and Austin (1956) describe *selection* strategies and *reception* strategies. Selection strategies are methods for concept attainment when the learner is able to choose the order of instance. Reception strategies are used in the more realistic instance of unpredictable, random instance presentation. Experiments involving participants trying to learn a concept represented by a specific pattern of shapes, borders, and colors on cards were used to test the effectiveness and frequency of strategies in situations permitting selection and situations which dictated reception.

Selection Strategies

These authors describe four hypothetical ideal strategies for selection. "Ideal" in this case refers not to effectiveness but to the hypothetical purity. This is acknowledgment that humans are unlikely always to use the same machine-like approach to a task. The first strategy is "simultaneous scanning," in which the individual generates all possible hypotheses (combinations of attribute values) and eliminates hypotheses as evidence arises. In "successive scanning," the second strategy, the individual chooses a single hypothesis and then selects examples to test that hypothesis until accepting it or having to reject in favor of another hypothesis. The third strategy is "conservative focusing," and involves finding a single positive example of the concept, and then varying only single attributes in successive instances. If the variation results in a negative instance, then it is one of the defining attributes. A focusing strategy allowing more than one attribute to change between instances is "focus gambling," the fourth strategy (Bruner, Goodnow & Austin, 1956).

These authors' first experiment involved showing each participant a card which exemplified a concept. The viewer could then select a card from an array of 64 displayed on a board, and learned whether it also was an instance of the concept. Observations of the types of choices participants made allowed the experimenters to classify the strategy in use as a scanning or focusing strategy. Each participant solved three concept problems; two in the manner described above, and the third with no array of cards from which to select. The third problem provided a variance in the demand on memory. Those individuals who used the focusing strategy were able to solve the third problem in an average of five trials; the scanners required thirteen. This experiment showed that the focusing strategy is generally more effective, and also revealed that under the conditions of the experiment, humans without prompting use strategies akin to the ideal strategies presented, although the strategies generalize to just scanning and focusing.

A second experiment suggested the choice of strategy may vary depending on the presence of order in the selection of cards. If the array of cards was well-ordered, so as to encourage systematic testing of attributes, more of the students involved in the test used a focusing strategy. If card presentation was totally random, more used scanning.

Reception Strategies

The conditions of the experiments used to test scanning strategies were somewhat unrealistic—humans usually have to take concept instances as they come, and do not have the luxury of modifying attributes to see if they are important. The researchers devised a second series of experiments to test strategy choice in the reception condition—when the learner must make the most of each instance as it presents itself in an arbitrary fashion.

The expected strategies were the "wholist" strategy (p. 131) and the "partist" strategy (p. 143). The wholist strategy is similar to focusing; the learner formulates an idea of the concept by using the entire first instance, and modifies it only when subsequent positive instances vary. The partist strategy is akin to scanning; the learner chooses a single attribute from the first instance, and then adds to it as subsequent examples warrant. If the single attribute chosen is ruled out by a negative example, then the learner reviews in memory all previous examples to formulate a new hypothesis.

The experiments testing these strategies, like those testing selection strategies, involved the use of abstract concept presented on cards (Bruner, Goodnow and Austin, 1956). A little more than half the participants used a wholist strategy (and half of these adhered to it faithfully). When time was a factor, the wholist strategy was vastly more effective, but both strategies worked equally well when there was no time pressure. For both strategies, as the number of attributes increased, the percentage of problems solved decreased. These results strongly reinforce the intuitive belief that minimizing complexity would be desirable in the presentation of concepts to novices.

Attaining Concepts in Material that Seems Familiar

In an experiment involving thematic material within the realm of experience of all the students participating, the authors noted some unexpected changes in behavior (Bruner, Goodnow and Austin, 1956). The experiment included two groups. One (the thematic group) used cards depicting an adult figure and a child figure. The attributes which varied were affect of each figure (angry or cheerful), gender of each, and mode of dress for each (night or day). The second (control) group's cards had the same number of varying attributes, but the figures were triangles or rectangles, and could be yellow or black, bordered or unbordered.

The average number of trials for the control group to correctly ascertain the concept was 6.1; for the thematic group it was 9.7. The ranges for the two groups were similarly disparate. Arithmetically, the two groups were solving the same problem—why should they differ so? The authors offer a precisely stated description of the intuition which comes to mind:

> ...the problem solver is likely to fall back upon reasonable and familiar hypotheses about the possible groupings. In so doing, he may be led into a form of successive scanning:

> the strategy par excellence for going through a list of hypotheses. ...thematic material will, more readily than abstract material, lead certain attributes to have nonrational criteriality: the subject will "hang on" to these and will formulate hypotheses around them. (Bruner, et al., 1956, p. 111)

What is implied here is of particular interest to anyone wishing to help others learn to categorize something which already seems familiar. To assist the learner in such cases requires some attempt to make the genuinely important attributes stand out enough to overshadow student preconceptions.

Individual Differences and Choice of Strategy

Besides the learning situation, is there any predictor of what strategy a person may use in concept attainment? Goodenough (1976) discusses the role of field dependence in choice of concept attainment strategies. Because of the difficulty field dependent learners have in differentiating parts from the whole, Goodenough suspected that field dependents would be more likely to choose a variation of the partist strategy—to focus on single outstanding features—to learn concepts. He offers the results of Kirschenbaum (1968), Dickstein (1968) and Shapson (1973), as support for his idea. Their experiments, using materials similar to those used by Bruner et al., (1956), all revealed a tendency for field dependents to use the less efficient strategy.

Suggestions from Concept-Attainment Theory

Concept attainment theory suggests consideration of the following factors in choice of illustration:

Instructional Pacing: The strategies employed by learners will differ depending on whether the instructional material is externally or self-paced. The number of attributes a learner may successfully use in concept attainment is a function of the time available. All other factors being equal, illustrations for externally-paced instruction should be less complex.

Previous Experience: Learners with genuine previous experience should be able to deal with greater visual complexity because of prior knowledge of many of the attributes. Less experienced learners may require simpler illustration. Learners who operate in a domain in which they believe they have knowledge may use less effective strategies because of interference of precious conceptions. Illustrations in the latter case ought to emphasize the attributes that truly define the situation.

Field Dependence: Field-dependent learners seem to employ less efficient strategies for concept attainment. Therefore, illustrations used in presenting visual concepts should be designed to assist field dependent learners use the correct features as the basis of their hypotheses.

Supportive Evidence

Some of the seemingly-conflicting results which have appeared in previous experimentation with realism in illustration provide a measure of support for the recommendations suggested by concept attainment theory. Dwyer (1972) performed a large number of studies using a lesson on heart anatomy accompanied by a variety of illustration types.

Effects of Pacing

One set of experiments used an externally-paced slide presentation as instructional method (Dwyer 1972). The general findings for these experiments indicated that line drawings provided the most effective illustration. A subsequent set of experiments used self-paced programmed instruction as the presentation medium. In contrast to the results of the experiment using externally-paced presentation, the students who performed best under this set of conditions were those who received instruction accompanied by realistic color photographs. Dwyer suggested that the photographs contain more inherent information, and the conditions of self-paced instruction are conducive to transfer. This contrast between the self-paced and externally-paced scenarios is exactly as we would expect from the suggestions of concept attainment theory.

Level of Prior Knowledge

Joseph and Dwyer (1984) tested for interaction between the degree of prior knowledge and the level of detail in instructional illustrations. For this experiment, the instructional material was once more the heart lesson, and was given in both self-paced and externally-paced formats. The researchers divided students into categories of low, medium, and high prior knowledge, based upon their performance on a physiology pretest. From this point, the experiment proceeded as did the previous experiments using the heart lesson. The experimenters concluded that:

1) Illustrations were effective in reducing differences in achievement between students with low and medium pre-test scores;
2) Illustrations did not enhance externally-paced instruction; and
3) Medium and high-level students may benefit from the use of realistic illustrations, depending on pacing and type of objective.

These results offer support for the consideration of the second factor in choice of illustration (the number of attributes to include depends in part upon the level of the learner's prior knowledge), as well as further evidence of the significance of pacing. However, since the subject material was not "thematic" and therefore unlikely to evoke preconceptions, there is little here to illuminate the role of the learner's *perceived* knowledge of the material.

Field Dependence and Visual Learning

Several researchers have sought interactions between field dependence and illustration type for a variety of tasks. Owing to the difficulty of field-dependents in articulating parts from the whole, many experimenters have expected to find an interaction between image complexity and level of field dependence. Some examples include Canelos, Taylor and Gates (1980); Canelos (1983); Canelos and Taylor (1981); Canelos, Taylor and Altschuld (1982); and Wise (1984). None of these efforts revealed any interaction. It should be noted that none of them included an identification task among their criteria, and all focused on monochromatic images.

Moore and Dwyer (1991) examined specifically the effect of color on student performance by level of field dependence. Their hypothesis was that the addition of color cues would aid field dependent learners in picking out significant information in the illustrations. Using the same lesson on heart anatomy illustrated by either black-and-white or color-coded line drawings, they found "nonsignificant interaction ...between treatment and the three levels of interaction" (p. 614) on performance as measured using the terminology and comprehension criteria. However, the results using a visual criterion (Dwyer & Moore, 1992) revealed a greater improvement in the performance of field-dependent learners when the lesson was color-coded. The improvement placed the achievement of field-dependents very near that of field independents. Results for the groups which used the lesson illustrated with monochromatic line drawings showed a wide gap in performance, depending on level of field-dependence. It appears that the emphasis color-coding places on definitive attributes may assist field-dependent learners to identify them.

Moore and Dwyer have demonstrated that for objectives which have a visual component, color cues may provide significant help for field-dependent learners. However, their objectives did not include a determination of possible interaction of illustration type with field-dependence for an identification task. French (1984) conducted just such an experiment. With a learner population of 492 trade apprentices, she examined the effects of detail in illustration on the ability of field-dependents and field-independents to learn to identify five types of diesel fuel injectors. The illustrations were either color-coded or black-and-white, simple or complex line-drawings. The presentation of material was by an externally-paced audio tape and filmstrip. Criteria for performance were first a task of identifying (classifying) an assortment of drawings of fuel injectors, and a second task in which the learner classified *real* fuel injectors.

French's results suggest that simple color-coded line drawings provided learning assistance for field dependent students, although color-cueing did not confer any advantage in general. This agrees with the findings of Dwyer and Moore (1992).

Conclusion

It has long been believed that the addition of illustrations to any effort to communicate enhances the effectiveness of the communication. Investigators have attempted to use cue-summation theory to predict in which instances illustrations of various types would prove most effective. Unfortunately, results from these efforts have been varied. One question unaddressed by these studies is how to choose *which* (attributes) to include or emphasize in illustration.

Concept attainment theory provides a means for selecting which cues to include in visuals based on understanding of the level of previous experience, the pacing of the lesson, and learner's individual differences. Application of concept attainment to previous results provides explanation for much of the variation which has previously confounded the research. Furthermore, inclusion of this theory in future efforts may allow much more precise and informed choices of illustrations, as well as suggesting use of types of illustration previously left unconsidered.

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The Pedagogy of Photorealistic Rendering

Jon M. Duff

Introduction

This paper discusses current changes in the teaching and learning of artistic rendering in light of technological advances that may cause teachers and curriculum planners to rethink both what is taught and the manner in which the results of the artistic process are valued and subsequently evaluated.

Many of you have seen the currently popular computer images on television, in the print media, and in film and marveled, "that looks just like..." In a short five years this technique has migrated downward from the domain of computer science Ph.D.'s to the desktop computers used every day. Those who produce these images must have a unique form of literacy—a hybrid right brain–left brain approach to visual images. The dilemma is understanding how this technology changes our long-held perceptions concerning how much visual ability a person needs to intelligently create, use, and evaluate such sophisticated images. *

You may wonder why this paper isn't full of photorealistic images. To be able to distinguish their subtle nuances, you need to view either digital output on a display, video tape, or a high quality digital print such as that produced by dye sublimation. Reproduction in a publication would require a 133 lines per inch halftone just to discern differences in materials, lighting, and rendering methods. Consult the references listed at the end of this paper for more examples.

As a classically trained illustrator, I have worked commercially for 25 years. During that time I have taught both part and full-time in the areas of graphics, illustration, and industrial design. Traditionally, it was important for illustrators to be able to draw geometries accurately and then to render various materials realistically in a variety of media. A skilled illustrator had to be able to represent chrome, wood, fabric, glass, earth, skin, and a host of other materials. In fact, a teacher could evaluate accomplishment in an illustrator by how well objects were modeled visually and how effective materials were represented.

> “Photorealistic rendering causes visual literacy and technological literacy to be inexorably linked. One simply can't separate the two.”

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* If it has been years since you have read *The Saber-tooth Curriculum* by J. Abner Peddiwell, this might be a good time to revisit the land of wooly bear clubbing and fish grabbing.

Current computer graphics technologies question the efficacy of this traditional approach because with photorealistic software and the appropriate hardware, effective renderings are within reach of almost anyone. Prove this by running a two-hour workshop where elementary students have chrome spheres bouncing around an electronic room by following a list of simple commands. What used to be a perceptual-intellectual-manipulatory function is now handled in software. One student can produce more effective renderings not as the result of superior knowledge and skill, but simply as the result of more computing power, more sophisticated modeling and rendering software, and higher quality output.

If you evaluate only the output, a student willing to spend $50.00 for a 1250x1250 dots per inch 16.7 million digital color print from a service bureau will be at a distinct advantage over a student stuck with 256 colors and a color ink jet printer. Photorealistic rendering causes visual literacy and technological literacy to be inexorably linked. One simply can't separate the two.

One way to look at the problem is from a historical context, one that views the computer as simply another tool, another medium for visual expression. There has been a historical succession of material and media developments, each allowing visual artists greater power in creating and distributing their images, each allowing the artist to be removed a greater distance from making the tools of their art. This position firmly accepts computer images as fundamentally different expressions. Just as it would be inappropriate to directly compare a pencil sketch with a watercolor wash, it would be inappropriate to compare a computer rendering with a manual rendering. The two are entirely different media. As teachers, we must juggle time and resources, making value judgements as to what should be kept in the curriculum and what is no longer appropriate.

A nagging voice says that the reason computer tools make sense is that they spring from traditional tools. Without a firm foundation in traditional rendering, computer rendering is an empty expression. Yet another voice says that is "oldthink." Traditional rendering tools and techniques only limit the ways that this new medium can be used. Is one, the other, or both true?

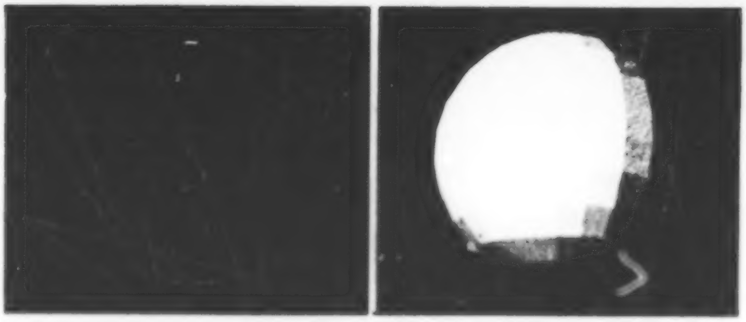
The availability of these rendering tools causes a fundamental change in the pedagogy of teaching rendering and in evaluating a student's development as an illustrator. Hopefully, as the result of reading this paper, the following two questions might be answered:

- If anyone can make chrome look like chrome, what is the value in evaluating the "chromeness" of the rendering? And,
- If rendering quality is not an appropriate developmental criteria, what is?

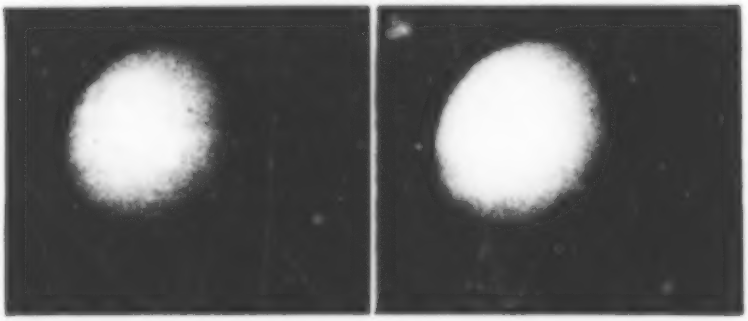
Brief Optional Technobabble

If you are well versed in computer photorealistic techniques you will want to skip this section. If you could care less how the images are made you'll also want to skip it.

A photorealistic computer image can be generated in one of two ways. First, three-dimensional computer geometry can be assigned properties such as material, finish, environment, light, haze, or movement. The computer then laboriously calculates the value (color and brightness) of every addressable picture element (pixel) in the scene. Although the scene is 3D the rendering is a 2D raster image (3D Studio, StrataVision, Ray Dream Designer, Alias, Topas). The second way is to apply filters to two-dimensional drawings. This method is less automated and requires more traditional artistic skills and sensibilities and usually results in a less photorealistic image



Wireframe Shading Flat Shading



Gouraud Shading Phong Shading

Figure 1. Rendering algorithms available for photorealistic renderings.

(PhotoShop, PhotoStyler, Fractal Painter). For the purpose if this discussion, photorealistic rendering refers to the former.

Four major rendering algorithms determine the *depth* of information at each pixel. See Figure 1. The greater the depth, the more realistic the image. *Wire frame rendering* represents intersections as lines. Planes are either transparent or visibility is determined. *Flat shading* assigns the same value to every pixel of a plane. This results in sharp faceted edges rather than smooth transitions. *Gouraud shading* calculates the value of pixels at each vertex of the plane and averages the values in between. This results in smoother transitions between planes but with no specular highlights or surface irregularities. *Phong shading* calculates a unique value for every pixel on a plane, allowing specular highlights and surface irregularities. See Figure 2. *Ray tracing* takes this one step farther by tracing the ray from every pixel back to its light source, noting how it changes color, brightness, and direction when it hits other objects. See Figure 3. This results in everything you get from Phong shading plus the influence of surrounding objects and light sources.

As you might expect, the more realistic the image, the greater the penalty in processing time. Ray tracing a detailed scene on a 60 mhz Pentium might take days and result in a file requiring 30 standard diskettes (40 mb). To do studio quality photorealistic rendering in acceptable time requires, as Tim Allen the comedian says, "More Power!"

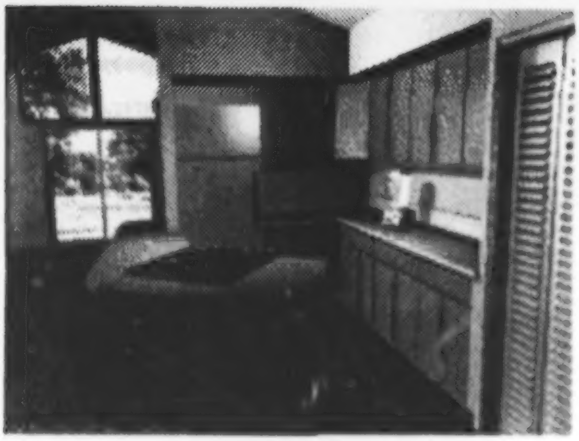


Figure 2. Phong shaded rendering with textures and bump maps (Stratavision).

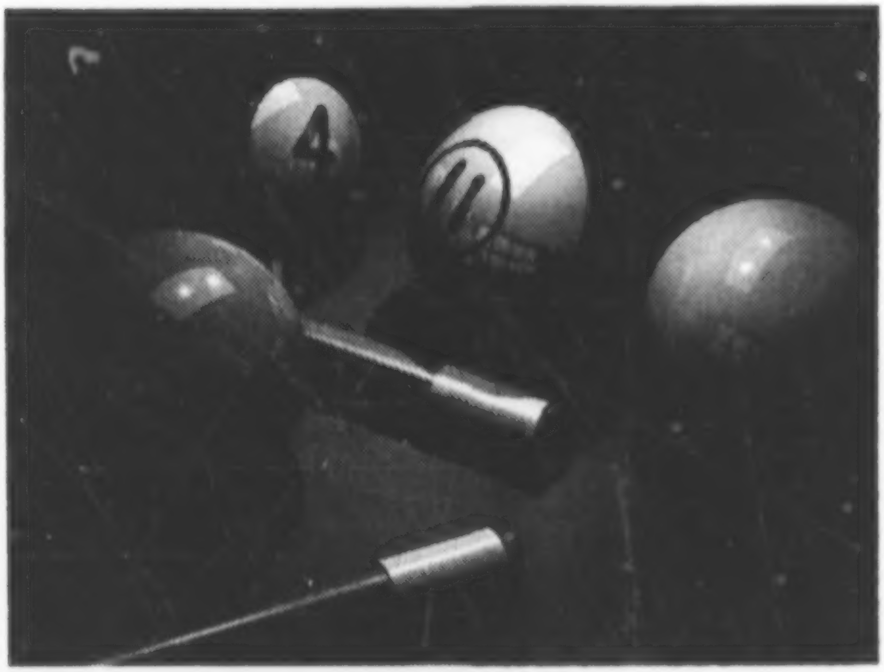


Figure 3. Ray traced photorealistic rendering (Stratavision).

Terms Defined

A *rendering* is a visual representation or depiction of a proposed or existing idea or physical situation. Renderings are done by illustrators, visual artists who combine artistic abilities with technical and commercial understanding. Such renderings are used to aid in decision making, document the visual nature of a finished or proposed design, or to persuade individuals to take action on the subject of the rendering. Renderings are used in product development, engineering, architecture, and marketing.

A *photorealistic rendering* is a depiction that appears so realistic that it appears to be a photograph. This type of rendering is of greatest value when the subject of the rendering does not exist. The closer a rendering depicts real-world situations, the greater confidence in decisions based on the rendering. Photorealism is independent of media—it can be done using manual or electronic tools.

Digital (computer) photorealistic rendering produces images that appear photographic by applying material, surface, and environment maps to valid two-dimensional, surface, or solid geometry. Ambient and directional lights are placed and a camera and view point chosen. A rendering algorithm is selected and the computer is allowed to render.

This word *rendering* describes the process of representing the natural world on a two-dimensional surface. There are levels of sophistication in this rendering process ranging from simple line drawings to illustrations that are photographic in nature. Renderings are usually ranked by how closely they approximate the generally held conception of natural appearance. Renderings differ from artistic impressions in that impressions are subject to the personal, political, social, and cultural biases and needs of the artist. The artist has the need for expression using art as the medium. We say that the artist works from an *internal aesthetic*. An illustrator, on the other hand, works from an *external aesthetic*, a controlling aesthetic that determines the nature of the image.

An Analogy

A person goes out and purchases a player piano and a roll that plays Beethoven's Moonlight Sonata. Is the person "playing" Beethoven? Is the person a musician?

A person goes out and purchases a Silicon Graphics Indy workstation with Alias software and a dye sublimation printer, then loads, renders, and prints a sample scene. Did this person "render" the scene? Is this person an illustrator?

To be honest, many would answer "who cares?" to each of the questions. If the music accomplishes its intended purpose, who cares if it is live, recorded, or canned. If the image accomplishes its intended purpose who cares if it is done by hand, by camera, or by computer. As an evaluation of the end product this is only partially valid because a live musical performance functions differently than recorded music. Images that are identified as being done on a computer function differently than images done by hand and emote a different response.

This suggests a difference between someone who creates something that a tool operates on, and someone who uses a tool. For example, popping a compact disk into a player and listening to someone play a piano sonata is two tools (the CD player and the piano) removed from the fundamental creative act—writing the sonata. Choosing an output device and selecting RENDER SCENE from a menu to get a photorealistic print is two tools (the computer and the printer) removed from the creative act—designing the scene.

Designing the Scene

So it would appear that the value in photorealistic rendering lies in those activities that occur *before* the actual rendering takes place. True, the rendering (like the playing of the sonata) is a method of establishing the validity, and evaluating the impact of the creative process. However, it isn't a necessary requirement and may actually interfere, either positively or negatively, with its evaluation.

A Pedagogy of Photorealistic Rendering

The previous discussion sets the stage for developing a strategy for teaching photorealistic rendering in such a way that the subject can be divided into *tool creation* and *tool use*. Students can then be evaluated as to their growth in understanding complex relationships of form, material, and presentation unique to this medium. This provides a bridge between traditional rendering and digital rendering.

Tool Creation

1. Creation of valid geometry. To a much greater degree, photorealistic rendering depends on valid computer geometry than did traditional rendering on valid drawing. Because the rendering engine can't make subtle changes in how surfaces or materials are interpreted, invalid geometry (surfaces that aren't closed, solids that aren't contiguous, intersections that are not positioned correctly in space, etc.) simply will not render correctly. Digital illustrators must be geometricians. They must be able to define geometry correctly and efficiently.

2. Creation of original material, environmental, and bump maps. The truly creative activity is not the simple selection of textures and maps (see point 5 below). An illustrator must be able to *create* maps that are realistic depictions of materials, textures, and environments. This probably bears the closest parallel to traditional rendering techniques. Being able to create bump maps as an alternative to geometric modeling is the mark of an efficient photorealistic rendering.

Tool Use

3. Placement of geometry into context (create the scene). This compositional aspect is probably the least dependent on digital rendering technology. Placing elements in space might be best taught using visual-haptic methods where physical models are manipulated by hand. This has the advantage of reinforcing the relationship of the physical universe to its representation in electronic space

4. Effective choice of lights and viewing position. The study of lights and cameras is critical in photorealistic rendering. The relationship of focal length to the traditional topic of perspective and an understanding of color and light and how the two impact sunlight, shade, and shadow colors for material and texture maps can determine the effectiveness of the rendering.

5. Choice of appropriate maps and filters. This is the modern example of having "good taste," something that was always difficult or impossible to teach. Inexperienced illustrators, given access to hundreds of textures, materials, and maps will almost always make horrific visual decisions. The old adage "less is more" still applies.

6. Choice of appropriate output medium. Photorealistic renderings are used for some purpose. They are distributed in some medium. Knowing the capabilities and limitations of offset lithography, gravure, video tape and digital display are imperative. Understanding digital color printing technologies and how raster images are stored and separated keeps an illustrator from making decisions that might ruin an otherwise effective image.

Summary

To answer the questions posed earlier, there is very little value in giving an illustrator credit for making chrome look like chrome using photorealistic tools. In fact, if the chrome doesn't look like chrome, it had better be for a good reason, out of conscious effort, and not from lack of software knowledge. The second question was also answered. What is of value is any activity *before* the actual rendering— planning, sketching, storyboarding; modeling, map creation, and light and camera positioning. This revives the old *product vs. process* argument. Even with the change in tools, or possibly exacerbated by it, we have the tendency to take the easy way out and evaluate the product.

Students and teachers alike must understand that if the geometry is correct, if material, environment, and bump maps are correctly designed and applied, if lights are effectively placed, and if cameras are selected and positioned so as to produce the desired view, that a great looking rendering is simply a matter of spending enough money on computer time and output.

Resources

Computer Artist. Nashua, New Hampshire: PenWell Publishing Company.

Elliot, S., Miller, P., & Pyros, G. (1994). *Inside 3D studio.* Indianapolis: New Riders Publishing .

Firebaugh, M. W. (1993). *Computer graphics tools for visualization.* Dubuque, Iowa: Wm. C. Brown Publishers.

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The Role of Graphic Elements in the Accurate Portrayal of Instructional Design

Robert C. Branch
Janet R. Bloom

The elements of a visual display should form a coherent system and convey a message that is unambiguous. "The role of the visual is a projection of the intent or purpose of its' creator. Illustrations in text are usually there to support the text and carry the authors' message and agenda" (Braden, 1994, p. 199), simplifying the readers' information processing. This type of processing involves perception and interpretation of a diagram.

Perceptions and interpretations can be influenced by the designers' choice of visual elements, which should help show the relationships among elements. Diagrams are the connection between an idea and the formation of a message. Grabowski (1991) defines message design as planning for the manipulations of the physical form of the message. Designs depicting processes such as flow diagrams are usually sequential and involve a directional element. Lines are one of the basic design elements found in visual communication. Lines are used to make shapes, indicate direction, and form outlines. "There are three basic shapes, all formed using lines: the triangle, the square, and the circle. All other shapes or forms are made using these basic figures" (Dondis, 1973, p. 44). "When we look at an image, our eyes tend to start in the upper left corner and then move around the image as we are directed to by lines, shapes, and other phenomena" (Berger, 1989, p. 47). Learning from print involves learning to sequence information and therefore to think in linear, sequential ways. The traditional way of thinking in most cultures, which uses a linear mode, often represented by a hierarchical model, should be replaced by a relational, interdependent way of visualizing.

This presentation reports on a comparison of two types of flow diagrams with similar content. "Graphic elements are entities in a diagram that represent objects, events, and concepts in an information network" (Hardin, 1988). For example, the ◆ is typically recognized as the symbol for a decision point in the display of a logic pattern whereas an ---> denotes direction or movement. This study is about the importance of meaning associated with selected visually illustrate ways in which graphic elements influence perception of entire models. "A visually literate person should be able to understand (read) images and use (write) visual language" (Ausburn & Ausburn's study, as cited in Hortin, 1978) intelligently. "The higher order thinking skills of analyzing, synthesizing, and interpreting the visual image do not come naturally" (Goldstone, 1989, p. 592). Higher order skills involve using abstract thinking skills, which must be taught in order to facilitate the ability to creatively construct meaning from visual displays. "Visual Literacy can be defined as the ability to comprehend and create information that is carried and conveyed through visual imagery" (Considine & Haley, 1992, p. 14). Visual Literacy refers to a group of vision competencies a human being can develop by seeing and at the same time integrating other sensory experiences. The development of these competencies is fundamental to normal human learning, and when developed, they enable a visually literate person to discriminate and interpret the visible actions, objects, and/or symbols, natural or man-made, that he encounters in his environment. Through the creative use of these vision competencies, he is able to communicate with others. Through appreciative use of these abilities he is able to comprehend and enjoy the masterworks of visual communication (Miller, 1985). Visual Literacy is based on the assumptions that:

1. interpreting visual images is idiosyncratic,
2. reading visual messages is a learned capability, and
3. through use of visual competencies, we can design messages which enable the potential for learner achievement.

Visual messages are as much a part of the communication process as is language. Readers should be able to translate both written and visual ideas to form a complete message. Visual literacy enables better use of both written, spoken, and visual skills. Visual displays help viewers understand content and therefore understanding these images becomes important in its' own right. We must therefore explore visual messages systematically, with the same attention given to the study of linguistics.

The study of visual communication is also important in that it helps sustain research on how people learn. Fleming (1983) states that teachers of instructional design still have problems in using appropriate imagery to attain desired learning outcomes. "Students can be taught to recognize, read, recall, and comprehend visual messages" (Considine & Haley, 1992, p. 15). Once people understand the method of designing and using visual messages they can use them effectively in their own attempts at learning. The application of visual communication to Educational Technology enables instructional designers to increase their ability to share both methods and concepts with current students and incorporate these ideas into "courses throughout the curriculum" (Schamber, 1991, p. 20). "Organized content and instruction of visual communication and its associated technology is necessary to enlighten and educate students for an information age and lifelong learning" (Bell, 1993, p. 12). The study of visual communication will benefit instructional design professionals as well as students in instructional design programs by allowing them to apply visual design techniques to aid the learning process and increase the probability of the receiver correctly interpreting the message being sent.

Procedural models, such as those that portray instructional design processes, depict a sequence of functions or tasks required to achieve some type of goal, and commonly employ visual elements. The instructional design process presented in Figure 1 employs a variety of graphic elements to communicate different types of functions toward a specified purpose. The connotations attached to each element represent a micro perspective of the entire procedure as well as contribute synergistically to the whole procedure as perceived by the viewers.

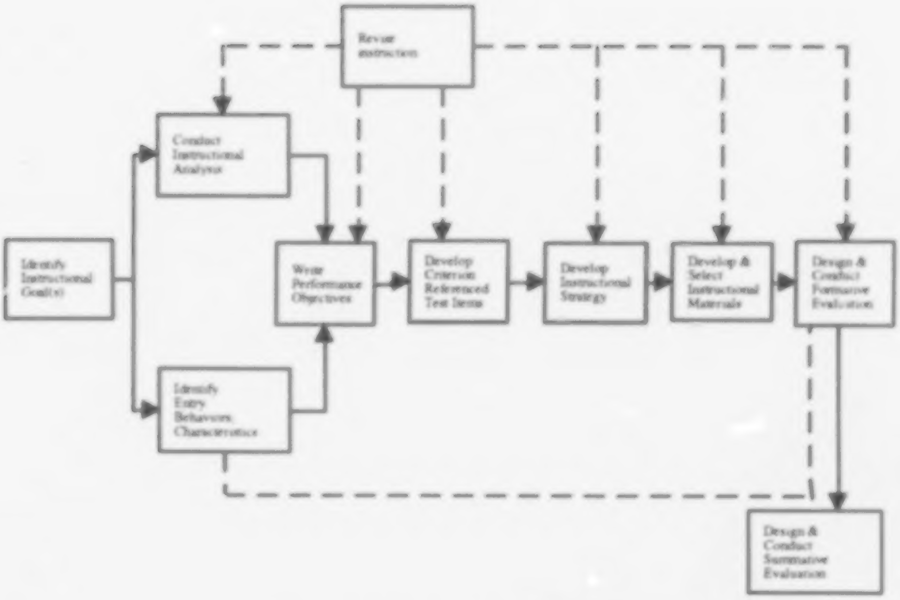
Revise instruction
Conduct Instructional Analysis
Identify Instructional Goal(s)
Write Performance Objectives
Develop Criterion Referenced Test Items
Develop Instructional Strategy
Develop & Select Instructional Materials
Design & Conduct Formative Evaluation
Identify Entry Behaviors, Characteristics
Design & Conduct Summative Evaluation

Figure 1. Dick and Carey (1990)

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Graphic elements which elicit viewer interpretations that are inconsistent with the original intent of the entire procedure diminish the effectiveness of a procedural model used to portray accurate functions or tasks. To the average viewer it may be unclear that the model presented in Figure 1 was intended to portray sets of functions and tasks which represented iteration, an open systems approach, and a systematic process. The same information is displayed in Figure 2, but the graphic elements, as well as their juxtaposition, are arranged in such a way as to convey meaning that is more consistent with the original intent of the procedure.

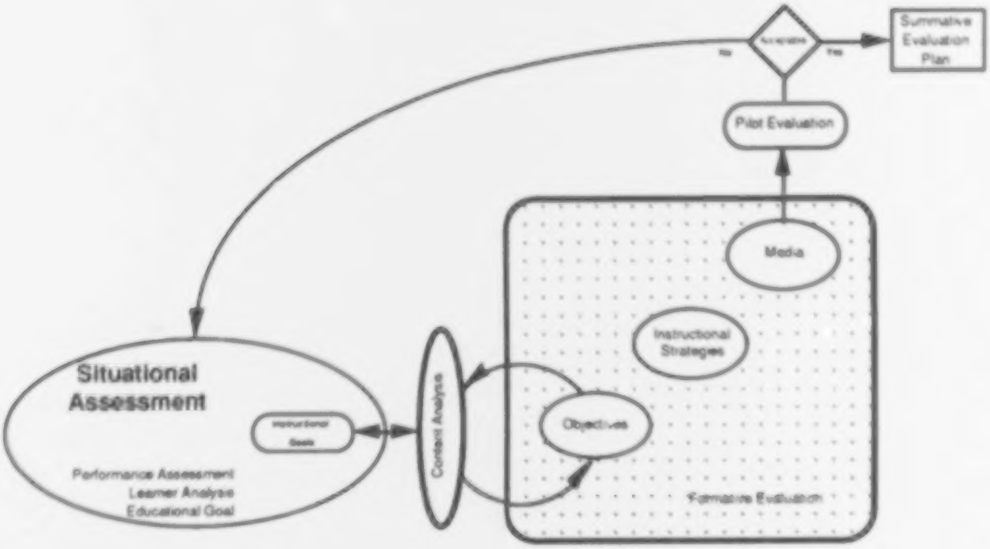
Acceptable
No
Yes
Summative Evaluation Plan
Pilot Evaluation
Media
Instructional Strategies
Situational Assessment
Instructional Goals
Content Analysis
Objectives
Performance Assessment
Learner Analysis
Educational Goal
Formative Evaluation

Figure 2. Branch (1994)

Perception

Perception is a relative thing, based on the relationship of visual elements to the environment, our own personal characteristics, how we organize information to make meaning, and our cultural experiences. "To perceive is to become aware through the senses, particularly through sight or hearing, and to achieve understanding by means of such awareness" (Preble, 1989, p. 5). Visualization has more to do with mental processing than physical ability. The mind and eye must work together to interpret visual images and conceptualize what we see. "Good diagrams promote understanding" (Hardin, 1994, p. 20) and clarify relationships. The importance of using effective visuals, and of knowing what makes them effective, is significant in communicating information. The majority of the communication process takes place through images. "We receive 80% or more of our information through our eyes, and much of this communication is done indirectly, through symbolic means: by words and signs and symbols of all kinds" (Berger, 1989, p. 1). The left brain is mostly involved in analytical, logical thinking, especially in verbal and mathematical processing. Its' mode of operation is primarily linear, and processes information sequentially. The right brain specializes in holistic information processing such as our orientation to space, art, body image, and recognition of faces. Both sides are involved in visual processing.

A study of intended and perceived image content showed a wide spread in the way people perceived picture contents, with very poor agreement between intended and perceived content (Pettersson, 1987). Gestalt psychology shows that perceptually the meaning of a whole diagram depends on the relationship between its' parts. "Everyday visual perception is, in fact, a continuous flow of these complex interrelationships" (Preble, 1989, p. 8). Visual elements have a conceptual relationship based on their similarity, proximity, and continuity.

Perception of the relationships in diagrams is also based on language training. Learned conventions such as reading from left to right, and top to bottom cause us to assume relationships even when none exist. Causal connections and subordinate effects are attributed to elements of the diagram based on how they are positioned. These biases are cultural and are learned by almost everyone at an early age.

Perception includes many similarities to cognitive processes, using existing schema on which to build new information. Based on this the content of a diagram becomes much more important than its' format. Visual information is usually retained longer in memory than verbal information. Using visuals also increases the level of retention of the viewer. Using both verbal and visual material causes dual encoding. This gives the reader a greater chance of recalling the information at a later date, and being able to use the information as the foundation on which to build further cognitive information as the foundation on which to build further cognitive structures. The quality of the images used is therefore extremely important in building schema on which to base future cognitive processing.

Instructional Design

Instructional design involves the systematic planning of instruction to increase its effectiveness and help people learn. Systematic planning is based on a series of pre-determined steps generated by knowledge of how people learn. "All the stages in any instructional systems model can be categorized into one of three functions: (1) identifying the outcomes of the instruction, (2) developing the instruction, and (3) evaluating the effectiveness of the instruction (Gagne, Briggs and Wager, 1992, p. 21). The systems approach is an interactive process which uses feedback to determine if its goals have been achieved. Systems models are iterative by nature, and revision continues until the desired outcomes are reached.

The effectiveness of the systems approach to instructional design is based on learner outcomes, the linkage between systems components, and the process being both empirical and replicable. The emphasis of a true systems approach is the process. Therefore, systems theory remains the theoretical origin for the majority of existing instructional design models (Edmonds, Branch and Mukherjee, in press). Many of today's instructional design models were designed in relation to a specific context such as K-12 education, higher education, business and industry, or government training needs (Edmonds, Branch and Mukherjee, in press). The uniqueness of the situation generated a model flexible enough to accommodate the needs of that particular environment and to design effective instruction for that situation.

Instructional Design professionals typically employ models that are based on systems theory to guide their practice (Edmonds, Branch and Mukherjee, in press). A system is a regularly interacting or interdependent group of items framing a unified whole (Edmonds, Branch and Mukherjee, in press). These models are part of the communication process within the field of instructional design, and enable us to explore, understand, and describe hierarchical characteristics, relationships and interactions, parameters, dynamics patterns, results of integration and synthesis, and modifications in system patterns (Edmonds, Branch and Mukherjee, in press). Instructional Design models should communicate the idea of multiple iterations and the cyclical nature that occurs in reality.

Instructional design models should be based on the idea of input-process-output, and have specific goals, results, or products which predetermine their use. Instructional designers also use models to communicate project requirements, to aid management practices, or to help in the decision making process. "Instructional design models are divided into three categories: (1) classroom focus; (2) product focus; and (3) system focus" (Gustafson, 1991, p. 6). The classroom focus involves designing better instruction. Product focus revolves around quick and efficient development of deliverables. Systems focus is based on the design of complete courses or curricula, and involves much more analysis of the task, the context, and the intended audience.

Research Questions

This study explored the interpretation of two types of flow diagrams composed of different visual elements intended to communicate the same meaning. Using linear and cyclical diagrams the study focused on whether, given a series of diagrams using linear elements and a series of diagrams using cyclical elements, both types of visuals conveyed the same message to viewers in relation to instructional design information and practice regardless of the type of diagram they were given. The specific questions were:

1. Do flow diagrams convey meanings typically associated with the process of instructional design?,
2. Do flow diagrams composed mainly of boxes and straight lines with arrows illicit the same adjectives as flow diagrams composed mainly of ovals and curved lines with arrows?, and
3. Do flow diagrams composed mainly of ovals and curved lines with arrows accurately portray the instructional design process more than flow diagrams composed mainly of boxes and straight lines with arrows?

Methodology

The participants were 93 college students at a University in the northeastern United States. The gender distribution was 54 females, 38 males, and one unknown, the age range was 20 and older, and 45% of the participants were in the 20 to 30 year old age category. The distribution of professional occupations and college majors showed that 37% of the participants were involved in instructional design as either graduate students or designers, another 21% were teachers, and 42% were from a variety of other occupations and college majors. The participants were randomly assigned to one of the two treatment conditions.

The task for each of the participants was to read a flow diagram and immediately write three to five adjectives to describe the diagram. The first treatment condition (Boxes) required the participants to read a flow diagram composed essentially of boxes connected by straight lines with arrows. The second treatment condition (Ovals) required the participants to read a flow diagram composed essentially of ovals connected by curved lines with arrows. Figure 3 represents the actual diagram read by the participants of the Boxes group. Figure 4 represents the actual diagram read by the participants of the Ovals group. Each participant was given two minutes to write three to five adjectives in a space provided on the same page of the diagram.

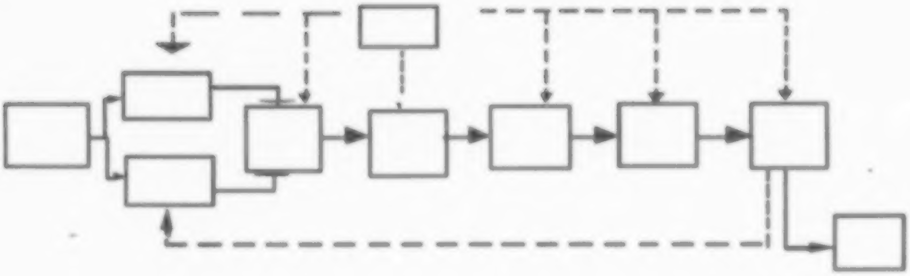

Figure 3. Flow Diagram A: Boxes with Straight Lines and Arrows

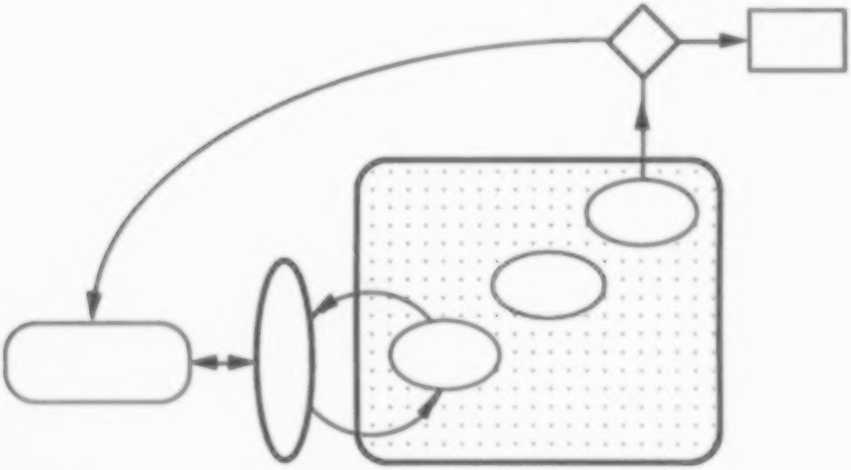

Figure 4. Flow Diagram B: Ovals with Curved Lines and Arrows

Data Analysis

The data were analyzed by tabulating all the written responses from the participants to determine frequencies, and to generate categories for describing the perceptions of the respondents relative to their perceptions about the diagrams they read. This method is consistent with that used in a study done by Branch, Moore, and Sherman (1988) which looked at the criteria for hiring instructional designers as professors or for positions in business and industry, and with a study conducted by Braden and Baca (1991) which looked at the components of visual literacy. The adjectives for each flow diagram were combined using a collegiate thesaurus (Merriam-Webster, 1991) and a collegiate dictionary (Webster, 1991) to identify words with the same meaning.

Results

Research Question 1: *Do flow diagrams convey meanings typically associated with the process of instructional design?*

Yes, similar adjectives were used to describe both flow diagrams. Words consistently referenced in the literature to describe the instructional design process were included as adjectives for the boxes and ovals flow diagrams such as linear, flowing, systematic, directional, iterative, busy, systemic, and structured.

Research Question 2: *Do flow diagrams composed mainly of boxes and straight lines with arrows illicit the same adjectives as flow diagrams composed mainly of ovals and curved lines with arrows?*

The results were inconclusive, due to the similarity of the lists of adjectives generated by the participants. While similar words were included in both lists (see figure 5) the adjectives used to describe the flow diagram with ovals also included words such as circular, geometric, cyclical, visual, and interactive.

Ovals		Boxes	
confusing	22	systematic	27
systematic	15	linear	16
flowing	14	sequential	11
circular	14	complex	10
visual	12	flowing	9
busy	7	boxed	6
beautiful	5	structured	6
geometric	5	related	5
bizarre	4	clear	5
interactive	4	feedback	4
directional	4	iterative	4
iterative	4	systemic	4
intriguing	3	busy	3
closed	3	detailed	3
systemic	3	design	3
structured	3	directional	3
non-linear	3	angular	2
moving	3		
linear	3		
simple	2		
boring	2		

Figure 5. List of Combined Adjectives

Research Question 3: *Do flow diagrams composed mainly of ovals and curved lines with arrows accurately portray the instructional design process more than flow diagrams composed mainly of boxes and straight lines with arrows?*

Based on the frequency with which participants cited both diagrams as cyclical or flowing both flow diagram types tend to portray an iterative, concurrent procedure, however, it appeared that the diagram using ovals did so more frequently. Further, the ovals tended to represent the synergistic nature of the instructional design process more than the boxes evidenced by comparing the frequencies of the first six words on each list (Figure 5).

Conclusions

1. The two flow diagrams, composed of different types of visual elements, were not perceived as having significant differences in the message they conveyed.
2. Both types of flow diagrams were perceived as being appropriate for the display of instructional design models, although the ovals diagram was perceived as being more representative of the synergistic nature of the instructional design process.
3. The ovals diagram was interpreted by more participants as a means of sending a more interactive, interdependent message.
4. Both flow diagrams illicited similar adjectives from the participants, and therefore neither was perceived as giving a more accurate portrayal of the instructional design process.

Discussion

The results provide preliminary data about the type of visual elements used in accurately portraying the processes and procedures associated with instructional design. Use of ovals and curved arrows effected both the meaning of the diagram and the perception of the relationships among the visual elements. The ovals diagram more accurately portrayed the fluid, flexible nature of the instructional design process, where as the boxes diagram was considered more rigid and structured. This is a better picture of the way instructional design takes place in reality; it is not necessarily a lock step procedure, but a more interactive, systemic process.

Several limitations were encountered during the study: (1) students past familiarity with flow diagrams may have influenced their perceptions of the drawing they were given during the study. This is a preliminary study, and the participants all had some introduction to instructional design. In the next stage of this study we will also be using participants who have no familiarity with instructional design, to see if their responses are significantly different from those collected in this study. (2) Students ability to translate their mental perceptions into verbal language using adjectives may have been a factor in their choice of descriptors. There is some question as to whether the term "adjective' influenced how participants thought about the flow diagrams, and what words they would have chosen if they had not been restricted to using only adjectives. This will be addressed differently in the next phase of data collection, where participants will either be asked use descriptive terms instead of adjectives, to describe the flow diagrams, or will be given a list of the most frequently cited words from this study from which to choose descriptors. Additionally, some self-imposed limitations were identified at the start of the study in order to make it manageable within the time available and workable with the population available for sampling. Also the number of participants included in the study was dependent on the time available for data collection and analysis.

The amount of learning that takes place when using visuals is dependent on what the learner knows and what skills the learner already has for reading the messages encoded in the visuals. "Another important factor is the strategy the teacher uses to guide or direct the learner's perceptual attention to the critical attributes of the visual material" (Fredette, 1994, p. 236). Better training in visual literacy will help instructional design professionals create visuals that are more easily understood, and will help students interpret those visuals more appropriately, thereby increasing learner achievement.

Recommendations

Instructional design professionals can improve the quality of the messages received by viewers by better understanding the use of visual elements in the portrayal of models, flow diagrams, and ideas. "Text and pictures should convey the same message or content so as to reduce the number of potential interpretations and increase the learning effect" (Pettersson, 1989, p. 217). Teaching visual literacy in classrooms across disciplines is necessary to help students learn more efficiently and make meaning of the variety and amount of information with which they come in contact on a daily basis. The need to convey messages to the intended audience, in this case students or other instructional design professionals, means we must better design instructional design models for optimum effect and to insure that the intended message reaches the audience.

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Effect of Color Coding and Test Type (Visual/Verbal) on Students Identified as Possessing Different Field Dependence Levels

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David M. (Mike) Moore

Considerable research has been conducted in an attempt to isolate those specific individual differences in variables which have an impact on information processing and acquisition. Much of this research has focused on the relationship which exists between individuals and the way they learn. The usefulness of this cognitive style research depends on its potential to identify specific information processing differences between different types of students. In this regard, cognitive learning style is generally considered to be the way in which an individual interacts with and processes information. The field independence/dependence theory (Witkin, Oltman, Raskin, & Karp, 1971) as a cognitive style construct has been researched extensively because it describes characteristics which are directly related to the learning process and most prescriptive of instructional outcomes. While research on the effect of field independent (FID)/dependent (FD) learning styles on achievement performance has not always been consistent, numerous studies have shown that FID and FD individuals do learn differently. Witkin, Moore, Goodenough, and Cox (1977) have defined field independence and field dependence as "the extent to which a person perceives part of the field as discrete from the surrounding field as a whole, rather than embedded in the field." In general, FID learners are inclined to reorganize or restructure information to suit their specific learning needs; whereas, FD learners are global in that they depend more completely on the external cues (available structure) in the stimulus field.

Since the visual-spatial element (structure) is an important dimension of FID/FD learning construct, researchers have attempted to design visualized instruction according to the characteristics of FID/FD learners, hoping to capitalize on strengths and compensate for weaknesses. The field independence/field dependence continuum, as it is applied to active learning, prescribes the degree to which learners will interact with a visual presentation, that is, whether the learner will merely interact with the instruction as presented or will analyze, reorganize and synthesize the stimulus field to make the content more meaningful and memorable (Ausburn & Ausburn, 1978). Witkin, et al. (1977) have noted that certain individuals interact to superfluous cues in a visualized instructional environment while others are able to identify precisely the critical information contained in a completely visualized environment. Field dependent individuals, when presented a visualized presentation tend not to modify the structure but accept and interact with it as it is presented. They tend to fuse all segments within the visual field and do not view components discretely. Field independents tend to act upon a visual stimulus, analyzing it when it is organized and providing their own structure when it lacks organization.

The FD/FID cognitive style appears to be especially important in the design of visually related information. Although many studies have examined the effects of visual attributes of learning (Dwyer, 1978, 1987) few have studied the effects of varied visual attributes on specific cognitive learning styles. Research has shown that color-coding helps learners organize or categorize information into useful patterns which enables the learners to interpret and adjust to their environment. Color coding may be considered a strategy in which students enhance or sharpen essential message characteristics by providing structures for the storage of new information . Dwyer (1978, 1987), in an extensive review of research on the impact of color vs. black and white comparison, found color versions to be significantly more effective than the black and white versions in facilitating student achievement of specific educational objectives .

It was hypothesized that color-coded visuals (color) would be more effective than black and white coded visuals (B&W) in enhancing the salient visual cues thereby making them more identifiable and instructional to field dependent learners. The color-coding would attempt to compensate for the restructuring skills absent in field dependent learners and subsequently lead to deeper information processing and increased achievement. This hypothesis seemed plausible since field dependent learners tend to be global in perception (Jonassen & Grabowski, 1993) and would be most inclined to take advantage of the increased structure provided by the color-coding.

If visualization provides structure to the information processing strategies in FID/FD learners, then it would seem to be logical that visual testing of the information would be a more valid assessment strategy. Nitsch (1977) and Battig (1979) have indicated that any change in the retrieval (evaluation) environment from that which occurred in the original learning environment causes marked decrements in learner performance. Under this paradigm information retention level is assumed to be a direct function of the encoding occurring at the presentation stage and the degree to which the retrieval environment recapitulates this encoding (Tulving, 1979). Optimum validity in cognitive assessment of learner information acquisition, apparently, can only be obtained if there is a high degree of congruency between the number of common features in the presentation (encoding) mode and the retrieval (evaluation) mode of instruction, e.g., if visualization is an integral component in facilitating learner encoding of the information, then visualization should also be used in the test items (decoding phase) used to assess learner achievement (Tulving & Thomson, 1973; Jacoby & Craik, 1979). It was hypothesized that the visual test format would be most effective in providing appropriate retrieval stimulus to optimize the achievement of FD learners.

Specifically, the purpose of this study was to examine the effect that coding (B&W and color) and testing mode (visual/verbal) has on the achievement of students categorized as FID/FD learners and to determine if there is an interaction among these variables. It was anticipated that the findings of this study would provide guidelines for teachers and designers of instructional software to be used with students possessing different cognitive learning styles.

Method

Subjects and Procedure. One hundred eighty-three students enrolled in basic educational psychology courses at The Pennsylvania State University and Virginia Tech University participated in this study. Students were classified as field dependent, field neutral, or field independent as a result of their performance on the Group Embedded Figures Test (GEFT), (Witkin, Oltman, Raskin, & Karp, 1971) and were divided into the different levels based on their mean achievement level on the GEFT. Students who achieved one-half standard deviation above the mean were considered to be field independent, i.e., scores of 16 and above (n=66, M =16.99, SD=1.12); those located one-half standard deviation below were classified as field dependent, i.e., scores 10 and below (n=43, M=7.43, SD=2.40) and those in the middle were classified as neutral, i.e., scores between 11 and 15, (n=74, M=13.04, SD=1.66).

Students in the three GEFT levels were randomly assigned to two treatment groups. The subject content for the study consisted of a 2,000 word instructional booklet on the anatomy and functions of the human heart. Each booklet contained 19 illustrations which were designed to illustrate the content being presented verbally. The illustrations in Treatment I, the black and white version, contained black and white coded line drawings which highlighted the information and processes being presented. Students in Treatment II received the same visuals as did students in Treatment I; however, several different colors were used to highlight the information and processes being discussed. Immediately after receiving their respective treatments students received the drawing test. Each student in each treatment randomly received in a visual or verbal format three separate 20-item multiple-choice criterion tests. Scores achieved on the four individual criterion tests (drawing, identification, terminology, and comprehension) were combined into an 80-item total criterion score. The visual form of the criterion tests utilized only one drawing with four or five letter labels in all items in which it was possible to do so while maintaining clarity and correspondence to the verbal test items (Figure 1).

VERBAL TEST ITEM

When blood is forced out of the right ventricle, in which position is the tricuspid valve?

A. partically opened C. open

B. partically closed D. closed

VISUAL TEST ITEM

The position of the tricuspid valve when blood is forced out of the right ventricle is:

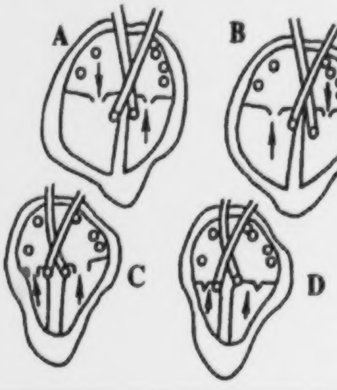

Figure 1. Criterion test items

However, two items in the terminology test and all items in the comprehension test required four drawings. The item stems of both the verbal and visual test questions were verbal and asked the same question. In addition, the visual distracters in the visual tests corresponded to the verbal distracters in the verbal tests as closely as was reasonable. Following is a description of the individual criterion tests which illustrates the kinds of educational objectives assessed in this study.

Drawing Test. The objective of the drawing test was to evaluate student ability to construct and/or reproduce items in their appropriate context. The drawing test (20 items) provided the students with a numbered list of terms corresponding to the parts of the heart discussed in the instructional presentation. The students were required to draw a representative diagram of the heart and place the numbers of the listed parts in their respective positions. For this test the emphasis was on the correct positioning of the verbal symbols with respect to one another and in respect to their concrete referents.

Identification Test. The objective of the identification test was to evaluate student ability to identify parts or positions of an object. This multiple-choice test (20 items) required students to identify the numbered parts on a detailed drawing of a heart. Each part of the heart, which had been discussed in the presentation, was numbered on a drawing. The objective of this test was to measure the ability of the student to use visual cues to discriminate one structure of the heart from another and to associate specific parts of the heart with their proper names.

Terminology Test. This test consisted of 20 multiple-choice items designed to measure knowledge of specific facts, terms, and definitions. The objectives measured by this type of test are appropriate to all content areas that have an understanding of the basic elements as a prerequisite to the learning of concepts, rules, and principles.

Comprehension Test. The comprehension test consisted of 20 multiple-choice items. Given the location of certain parts of the heart at a particular moment of its functioning, the student was asked to determine the position of other specified parts of the heart at the same time. This test required that the students have a thorough understanding of the heart, its parts, its internal functioning, and the simultaneous processes occurring during the systolic and diastolic phases. The comprehension test was designed to measure a type of understanding in which the individual can use the information being received to explain some other phenomenon.

Total Test Score. The items containing the four individual criterion tests (drawing, identification, terminology, and comprehension) were combined into an 80-item composite test score. The purpose was to measure total achievement of the varied levels of objectives presented in the instructional unit.

Analysis

A series of 2x3x2 analyses of variance was used to analyze students' achievement on each of the four individual criterion tests and a total test score. The range of scores possible on the total test was 0-80. Main effects considered were cognitive style (field dependent (FD), neutral (N), and field independent (FID)), color-coding (color and B&W) and type of test format (visual and verbal). Interactions among cognitive style, color-coding and testing mode were also of interest. The alpha level was set at .05 for all analyses. Kuder-Richardson 21 reliability coefficients from the visual format test and the verbal format test were both .92.

Results of the individual criterion tests plus the combined total test are as follows.

Results

On the **Drawing test** scores an analysis of variance indicated significance differences on cognitive style, F (2, 171) =8.88, p<.05), in favor of field independent students as predicted, on color-coding, F (1, 171)= 20.91, p<.05), in favor of color-coding as predicted and on the type of test, F (1, 171) = 7.83, p<.05, in favor of the verbal test which was not predicted. On the **Identification test** scores an analysis of variance indicated significance differences on cognitive style, F (2, 171) =6.73, p<.05, in favor of field independent students as predicted and on the type of test, F (1, 171) = 7.67, p<.05, in favor of the verbal test which was not predicted. On the **Terminology test** scores an analysis of variance indicated significance differences on cognitive style, F (2, 171) = 12.69, p<.05, in favor of field independent students as predicted. On the **Comprehension test** scores an analysis of variance indicated significance differences on cognitive style, F (2, 171) = 10.19, p<.05, in favor of field independent students as predicted. However, when all criterion tests were combined into a **Total test score**, an analysis of variance indicated significant differences on cognitive style, F (2, 171) =13.40, p<.05, in favor of field independent students as predicted, in color-coding, F (1, 171) =5.37, p<.05, in favor of color as predicted (but color-coding did not assist field dependent students) and on type of test , F (1, 171) = 4.28, p<.05, in favor of the verbal test which was not predicted.

Discussion

The results of the study support the contention that field independent and field dependent learners differ in the cognitive process they use as well as in the effectiveness of these processes in facilitating information acquisition. This finding is also consistent with previous reviews of the literature that have concluded that field independent learners exhibit an active hypothesis-testing strategy towards learning, whereas field dependent learners tend to employ a more tentative or spectator approach to learning (Witkin, et al., 1977; Goodenough, 1976). This study verifies the fact that field independent learners are able to perceive relevant information as discrete from their background and restructure information in a manner conducive to facilitating memory and recall (Tulving, 1968). It also lends support to the contention that field dependent learners tend to have difficulty separating relevant items in the percept from the irrelevant background. The figure-ground confusion experienced by the field dependent learners seemed to be especially acute when perceiving a relatively complex stimulus without having provided organized structure. Apparently, when field dependent learners interact with a complicated stimulus field, the field remains complicated because they attempt to remember the entire stimulus percept.

While the internal variable of interest in this study was the cognitive style of field dependents-independent students, the external variables of interest were color-coding and test format. In terms of color-coding it was hypothesized that the color-coding would make the relevant cues more obvious to the field dependent learners, thereby reducing achievement differences between the field independent and the field dependent learners. The color-coding mean was significantly higher on the total test than the black & white mean. However, the color-coding illustrations apparently provided an insufficient structure for the field dependent learners since achievement was not significantly enhanced. This result may be explained by the fact that possibly the covert rehearsal activity of merely receiving the color-coded structures was not sufficiently intense for the field dependent learners to investigate the level of information processing necessary to facilitate increased comprehension of the intended content (Bransford, 1979). The performance of the field dependent learners might have changed significantly if the directions in the instructional booklet had indicated that the color-coded structures were designed to help them organize the information and that they would not only have to understand the functions of the human heart but would also have to perform on a test measuring knowledge of heart related terminology and the functions of the various parts of the heart during the diastolic and systolic phases. In addition, the fact that there was not a color-coded dependent measure for the groups that experienced the color-coded treatment may have negated any possible advantage of these treatments. This should be investigated in future work.

The hypothesis that optimum validity in cognitive assessment of learner information acquisition would be obtained if there was a high degree of congruence between the number of common features in the visual presenting (encoding) mode and the retrieval (evaluation) mode was not realized in this study. Students who had received the visualized presentation and the verbal test format achieved significantly higher scores than did students who received the visual tests. A number of explanations may be proposed in attempting to interpret this finding. Glanzer and Clark (1963) have advanced the notion of a single information-processing system (verbal-loop hypothesis); they contend that visual information is translated into and stored in verbal/symbolic form. When this information is to be retrieved, it is retranslated from the verbal/symbolic form back to the original visualization. If this situation prevailed then it would be reasonable to expect that student performance on the more familiar verbal oriented tests would be higher than on the unfamiliar visual tests. Additionally, Holliday, et al (1977), have argued from a zero-sum standpoint that display of visuals in a test may result in the readers paying more attention to one cue and less to another, resulting in reduced effectiveness of the visualization.

Other researchers (Craik & Tulving, 1975; Moscovitch & Craik, 1976; Fisher & Craik, 1977) have proposed the notion that sensory feature processing precedes semantic analysis and that visual information processing need not unfold in lockstep fashion with antecedent features. This is an important point, because unless sensory information is coded in a usable configuration it is lost. Under these circumstances, information retention is assumed to be a direct function of the encoding at the presentation stage and the degree to which the retrieval environment recapitulates this encoding (Battig, 1979; Tulving, 1979). The results of this study seem to indicate that the visual portrayal (rehearsal) of the information being presented was not sufficiently intense enough to optimize coding of the information so that the presentation of similar cues in the evaluation mode would enhance the retrieval of the intended information.

In summary, the results of this study indicate that the concepts of field dependence/field independence is an important instructional variable in the teaching/learning process and that color-coding and test format remain as viable instructional variables for further experimental exploration.

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Using Symbols in International Business Presentations: How Well Are They Understood?

Robert E. Griffin
Rune Pettersson
Ladislaus Semali
Yasuo Takakuwa

Purpose Of The Study:

Do clip art and other graphic additions enhance the communicative ability of overhead transparencies and slides used in business presentations? Should we assume they help or might they hinder a presentation? This study was undertaken to amplify a previous study by Griffin (1993). The purpose of the original study was to determine how well commonly used graphic symbols were understood by business people in the United States. However, since much of today's business is conducted in a global environment, it is important that any study of business presentations should take a world perspective. Many researchers have tried to point out the highly biased nature of visual communication. Berger (1989) said that we do not just see but that we have to learn to see and what to see. Forsdale (1981) described that background, accumulation of experiences and culture are critical for interpretation of visual images. These authors, and many more, have pressed for a deeper awareness of differences and biases in the selection of images that we use in messages. All of these authors remind us that the selection of visuals to be used in a presentation is not merely selecting pretty pictures, but rather part of the scientific process of complete message design. Simply adding a picture to a message does not enhance the messaage.

The purpose of the study reported in this paper is to measure how well business and professional people from various cultures interpret symbols that would be commonly used in international business presentations. The researchers in this study had business contacts with audiences in different countries. The researchers and their countries were:

- Robert E. Griffin - United States
- Rune Pettersson - Sweden
- Ladislaus Semali - Tanzania
- Yasuo Takakuwa - Japan

How The Study Was Conducted:

The research was conducted by administering questionnaires to subjects in the United States, Sweden, Tanzania and Japan. The questionnaire consisted of fifteen black and white symbols with a space for the subjects to write a free form response. The symbols were the same as those used in the original Griffin (1993) study. The symbols were selected from the clip art collection of Software Publishing's Harvard Graphics business graphics software. Each researcher tested the subjects from their own country. Each made an attempt to limit the subjects to those who would be classified as part of a business population rather than non-business people. For those readers who are interested in all of the responses from all of the countries, we have included the data in Appendix A at the end of this report. Statistics about the subjects selected are shown in Figure 1.

Country	Surveyed	Mean Age
USA (N=87)	M=43	26.1
	F=23	24.7
	Unknown=21	
Sweden (N=81)	M=49	40.9
	F=32	37.3
Tanzania (N=76)	M=45	39.8
	F=30	33.2
Japan (N=58)	M=39	42.0
	F=15	23.1
	Unknown=4	
	Unknown=1	

Figure 1 - The Research Population

Each researcher administered the questionnaire to the subjects in his own country and translated the answers into English. The completed questionnaires were then sent to one of the researchers on the team for classification and tabulation. This person classified all of the questionnaires at one time in order to minimize any categorization problems. It was felt that even if all members of the research team did not agree with the eventual classifications, at least the classifications would be consistent. This method was also used in the original Griffin (1993) study. The data was then compiled, graphed and sent to each of the researchers for interpretation and comment.

The interpretations were then compiled and circulated to all of the authors' and each was able to comment by using a round robin arrangement.

Methods For Interpreting Symbols:

Many methods have been established for classifying symbols. When this team of researchers first examined the compiled data it was difficult to make any sense from what the data said. None of the classic classification categories helped in the interpretation. A method of classification, which was first suggested by Pettersson for this study, was eventually developed by the team. The tested symbols were divided into three categories: verbal symbols, pictorial symbols and abstract symbols.

Verbal symbols were defined as letters or alpha numeric characters used as a picture which were known by a specific population. Symbols used in the study which fell into this category were: pesetas, information, copyright and the British pound. These symbols are shown in Figure 2.

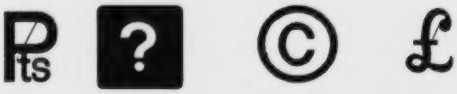


Figure 2 - Verbal Symbols Used In The Study

Pictorial symbols were presentations seen as real items. The drawings need not be perfectly realistic, but they should be close renderings. Symbols which fell into this category were: oil drum, thumbs up, scientist, check, copier, semi and tanker. These symbols are shown in Figure 3.

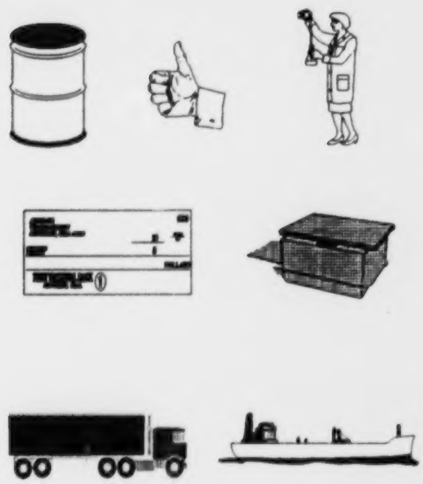


Figure 3 - Pictorial Symbols Used In The Study

Abstract symbols provided a great deal of variety in their interpretation. These symbols were also pictures or drawings, but the meaning was substantially broader than most would assume. It was a stretch of the imagination to move from symbol to definition. Symbols in this category were: award, mining, star and people. These symbols are shown in Figure 4.

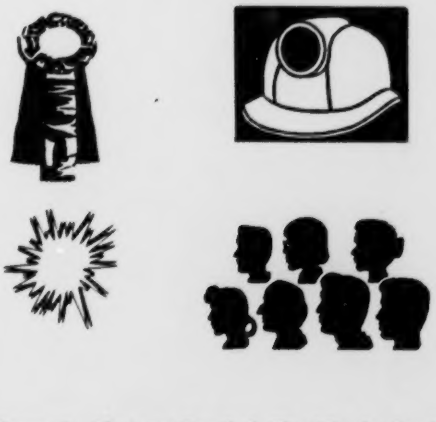
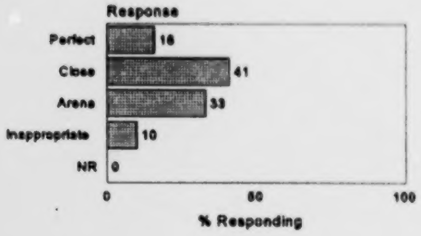


Figure 4 - Abstract Symbols Used In the Study

Observations From The Study:

Distinct observations can be made about each of the three classifications of symbols used in this study. The verbal symbols resulted in many interesting observations. Symbols in this category were either clearly understood or not understood by all the subjects. There was very little middle ground (or, as we called it in the paper, arena responses). In verbal symbols, if the subjects knew the language from which the letters or characters were derived, then they appeared to understand the symbol. Otherwise, there was confusion about the meaning of the symbol. As an example, in the U.S. and Sweden the information symbol was readily recognized. In this measure the U.S. recorded 16 perfect responses while Sweden recorded 23 perfect responses. This was a high number of perfect responses. This was not the case in Japan and Tanzania. For example, there were no perfect responses in Tanzania and only 14 perfect responses in Japan. More importantly with the Japanese data there were 64 inappropriate responses. One would speculate from this that the U.S. and Swedish population were familiar with the use of the question mark as used in standard English while the Japanese and Tanzania subjects were not. This data is shown in Figure 5.

U.S.



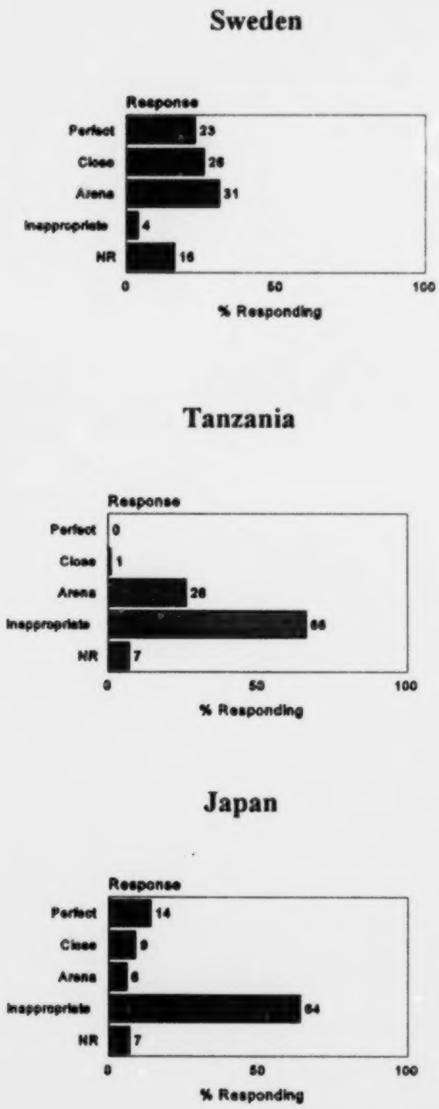
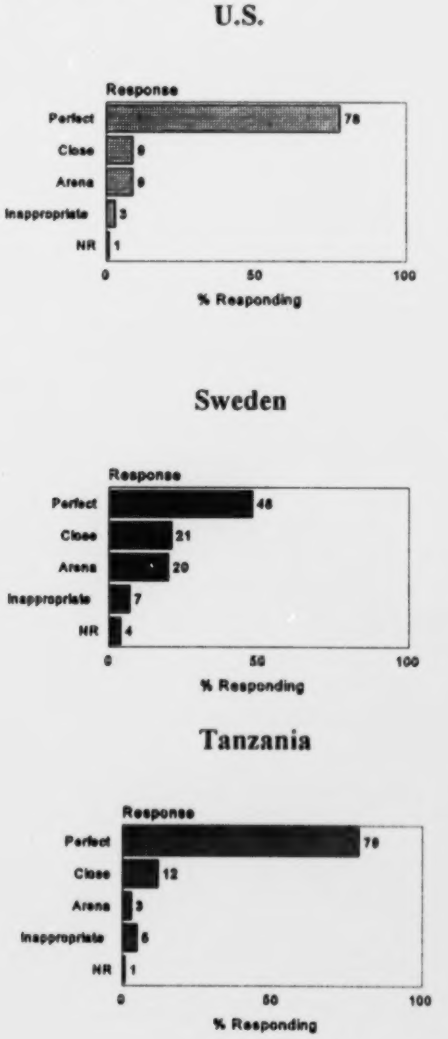


Figure 5 - Data For The InformationSymbol

The category of pictorial symbols contains what most of us think of as symbols. For symbols in this category we would expect a large number of perfect, or close, answers and very few inappropriate, or no, responses. The common sense reasoning for this is that the symbols look very much like the real object, therefore subjects should be able to identify them. For example, we can see that many subjects were able to readily identify the copier symbol. The data on the copier symbol is shown in Figure 6.



BEST COPY AVAILABLE

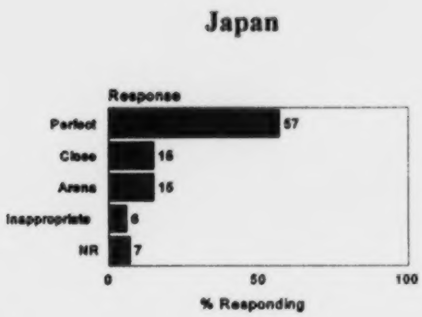


Figure 6 - Data For The Copier Symbol

However, a closer look at the data reveals some interesting statistics. If we look only at pictorial symbols we can see a clear rank order of understanding based on the country. The rank ordering of the mean number of correct responses is shown in Figure 7.

USA	***80***
Sweden	***69***
Tanzania	***60***
Japan	***48***

Figure 7 - Rank Order Of Means For Pictorial Symbols

It would be easy to assume from this order that the US population must be the most skilled at understanding the meaning of pictorial symbols. That assumption probably is not true. Instead, because the symbols used in this study were designed for a predominately US audience, the variation in responses is a result of cultural differences. This can be tested by using symbols designed for a Japanese audience to see if that results in higher scores in Japan and lower ones in Sweden, Tanzania and the United States.

Abstract symbols were the most difficult symbols for all audiences to comprehend. Definitions differed by symbol and culture. These differences are shown in Figure 8.

Symbol	**Japan**	**Sweden**	**Tanzania**	**U.S.**
Award	Similar	Similar	Similar	Different
Mining	Different	Similar	Different	Similar
Star	Similar	Similar	Different	Different
People	Different	Different	Different	Different

Figure 8 - Differences In Abstract Symbols Compared Between Cultures

It appears that because abstract symbols are culturally dependent they are very difficult to understand.

It is also important to understand here that abstract symbols were very difficult to classify. For example, one of the researchers for this paper felt that the award symbol should have been classified as a pictorial symbol. For one culture this may have been a pictorial symbol, but for others it is an abstract symbol.

Conclusions Of The Study:

The study resulted in several conclusions about the use of visuals in business communication. The conclusions can be divided into general visual comments and international implications.

Let's first deal with a general conclusion about visuals.

Conclusion 1 - There are many ways to interpret symbols. Very few people will share the same understanding of any given symbol. Thus, when we consider the importance of business communication and the fragile nature of the message, business people must recognize that symbols mean different things to different people. Those who are concerned about communicating an accurate message need to guard against the use of random and noncommunicative symbols in their message.

In this study it was common for subjects to give up to 20 meanings for each symbol. For example, the Swedish subjects gave 20 different definitions of the star symbol. Some examples of Swedish definitions for the star symbol were: bang, explosion, note, sun and highlight. The Japanese subjects provided 12 different definitions for the star symbol including: flash, explosion, sea urchin and danger. Clearly some symbols are difficult to interpret.

This conclusion provides some guidance to visual designers. If you must use symbols in presentations, use symbols designed for the culture and consider using only verbal or pictorial symbols. Using abstract symbols generally leads to communication difficulties.

The second conclusion deals with the international implications of the study.

Conclusion 2 - There are strong cultural differences in interpreting the meanings of symbols.

In a conclusion drawn by Pettersson, the Swedish member of the team, the symbols in this study were apparently designed for the U.S. market. An interesting irony is that the symbols were not particularly effective communication devices in the U.S. phase of the study. However, they were even less effective in the Swedish, Tanzanian and Japanese phases of the study. For symbols to be even minimally effective they must be designed for that culture.

Again, advice to visual designers based on this conclusion: do not fall into the trap of using symbols as communication devices that seem to be without language barriers. Symbols, when used in a culture for which they were not designed, appear to distract from communication. Visual designers who need visuals for use in other cultures should research their task very carefully.

This study of visual symbols has been a fascinating experience for all of the researchers involved. It has evolved from a simple idea developed around a luncheon table to an exciting and dynamic study with many implications yet to be explored. Our hope is that others join the work and add to the investigation of how and what visual symbols actually communicate.

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Appendix A
Date Recorded By Symbol and Country
Shown As Percentages

Award	Perfect	Close	Arena	Inappropriate	NR
U.S.	7	35	22	32	4
Sweden	8	6	1	78	7
Tanzania	1	2	1	78	17
Japan	0	3	2	79	16
Check					
U.S.	88	5	5	1	1
Sweden	60	5	19	15	1
Tanzania	50	15	34	0	1
Japan	27	22	32	17	2
Copier					
U.S.	78	9	9	3	1
Sweden	48	21	20	7	4
Tanzania	79	12	3	5	1
Japan	57	15	15	6	7
Copyright					
U.S.	44	0	2	46	8
Sweden	58	2	0	31	9
Tanzania	12	0	1	73	14
Japan	3	2	0	76	19
Information					
U.S.	16	41	33	10	0
Sweden	23	26	31	4	16
Tanzania	0	1	26	66	7
Japan	14	9	6	64	7
Mining					
U.S.	4	36	51	7	2
Sweden	5	40	41	11	3
Tanzania	7	31	28	27	7
Japan	0	12	21	66	1

Oil Drum	Perfect	Close	Arena	Inappropriate	NR
U.S.	16	52	30	0	2
Sweden	27	49	25	8	0
Tanzania	4	44	9	31	12
Japan	0	52	38	7	3
People					
U.S.	26	27	42	5	0
Sweden	6	74	19	1	0
Tanzania	11	26	57	5	1
Japan	2	9	48	38	3
Pesetas					
U.S.	1	0	0	92	7
Sweden	19	1	0	54	26
Tanzania	0	0	0	80	20
Japan	0	0	0	72	28
Pound					
U.S.	73	6	2	13	6
Sweden	70	15	3	9	3
Tanzania	95	5	0	0	0
Japan	16	3	2	62	17
Scientist.					
U.S.	15	45	34	3	3
Sweden	2	70	21	6	1
Tanzania	2	47	47	2	2
Japan	4	19	46	21	10
Send					
U.S.	24	57	17	1	1
Sweden	6	60	33	1	0
Tanzania	2	43	52	1	1
Japan	14	24	52	7	3

Star	Perfect	Close	Arena	Inappropriate	NR
U.S.	1	72	20	6	1
Sweden	2	12	63	16	6
Tanzania	0	1	95	3	1
Japan	0	10	60	28	2
Tanker					
U.S.	24	60	13	2	1
Sweden	8	71	16	5	0
Tanzania	0	31	69	0	0
Japan	23	33	36	3	5

Thumbs Up	Perfect	Close	Arena	Inappropriate	NR
U.S.	19	67	3	11	0
Sweden	11	55	7	26	1
Tanzania	5	83	0	8	4
Japan	0	48	6	44	2

Considerations for CBI Screen Design with Respect to Text Density Levels in Content Learning From an Integrated Perspective

Ismail Ipek

Introduction

Theoretical and technological advances in the areas of psychology, learning, and computer technology have intertwined to produce the developing field of computer based instruction (CBI) which is a delivery format that teaches via a computer program. The CBI program guides the student through an instructional event and allows for practice time, the opportunity to assess the student's performance during instruction, and gives feedback and remedial help (Alessi & Trollip, 1985). For thirty years, it has been recognized as an effective tool for improving both learner performance and achievement (Kulik & Kulik, 1991; 1987; 1986; Kulik, Bangert & Williams, 1983; Kulik, Kulik & Cohen, 1980). It has also provided an opportunity for educators to control and study learning events.

Early CBI tutorials were created according to behavioral models. Today, psychologists have moved from using behavioral models to using cognitive models, which do take into account individual cognitive styles and processes. The move toward the use of cognitive models by psychologists has resulted in the need to find new methods of presenting information, in particular, the need for designing text layouts that facilitate the learning process (Grabinger & Amedeo, 1988). CBI developers have kept pace with advances in psychology and, as Park, Perez, and Siedel (1987) have indicated, the growing concern for teaching cognitive tasks such as problem solving, thinking, and language acquisition has caused CBI developers to begin incorporating cognitive learning principles and instructional strategies in their designs. Actually, CBI has become an effective tool for investigating cognitive learning principles and instructional strategies (Anderson, 1982).

The purpose of this paper is to examine variations of text density levels for content learning in a CBI tutorial from an integrated perspective. In this way, the purpose is addressed to these questions; (1) What is the text density ? (2) What are the relationships among text density approaches? (3) What are the contributions of text density for learning and how perceptual skills and human factors can be used for a CBI tutorial? At the end of the paper, considerations will be indicated and discussed to create effective text density levels in CBI screen design according to human-computer interaction and information processing as a perception style.

CBI Screen Design and Text Density Levels

High-density text contains more words than low-density text but may convey the same basic meaning. Variations in text density levels may effect the interaction between perception and communication. CBI designers are faced with certain technical limitations when presenting information via a computer screen. They must work not only within the confines of limited screen space, display area and page size, but must contend with the problems of resolution, forward and backward paging and limited cues regarding lesson length. Because computer text offers less flexibility than books in the presentation of text, it is more difficult to effectively present instructional material on the computer than it is in print (Morrison, Ross, O'Dell, & Schultz, 1988a; Morrison, Ross, & O'Dell, 1988b; Ross, Morrison, & O'Dell, 1989; Grabinger, 1983; Grabinger & Amedeo, 1988, 1985). Generally, text on screens has been found to be less legible than text on paper (Gould, Alfaro, Finn, Haupt, Minute & Salaun, 1987; Muter, Latremoulle, Treurniet & Beam, 1982).

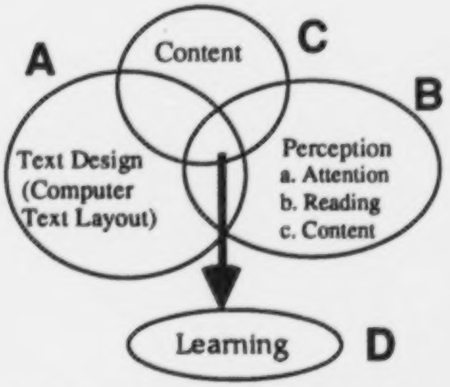
These limitations suggested that research was needed regarding variation in text density levels on the computer screen. Because text density is significantly related to manipulating and reducing rules in content, the presentation of text using those rules helps maintain the meaning when the content is reduced. For example, when the content is reduced, the main idea may be lost unless text density rules have been effectively used to cue the learner's cognitive processes. The effective use of variations in text density materials in a program is essential in developing an alternative method of presentation in a CBI tutorial.

There are two approaches for understanding the density levels. One is high and low density levels in Morrison et al. (1988a, 1988b) studies. Another is chunking that indicates a process between nominal stimulus (actual text) and effective stimulus in Grabinger & Amedeo (1988). Density levels are determined based on the amount the information content has been reduced or the percentage of information that has been presented. In brief, the number of characters or number of words are used as density criteria in a text (Schultz, 1989; Morrison et al. (1988b). Low density text materials are generated from conventional text by (a) defining a set of rules for shortening the text; (b) having different individuals apply the rules to the rewriting of the text; and (c) requiring those individuals to arrive at a consensus on the final content (Morrison, O'Dell, Ross, Schultz, & Wheat, 1989a; Morrison et al. 1988a, 1988b). High density may indicate the actual text but it also can be text reduced from print materials, because research indicates that text density levels are a continuum (Schultz, 1989, Morrison et al. 1988b).

Learner control is an important option to investigate when talking about the effectiveness of the text density variable. Ross, et al. (1988a) suggested that text density level in content information provides attributes in organization and elaboration for different cognitive styles.

Grabinger & Amedeo (1988) suggested that text density is related to the meanings among words between nominal stimulus (actual text) and a reader's representation (effective stimulus). Effective stimulus refers to the integration of information, either within an existing schema or by creating a new schema (Grabinger & Amedeo, 1988; Morrison et al, 1988b; Neisser, 1976). Nominal stimulus refers to the environment (actual text) and to meaningful information in a text (Morrison et al, 1988c; Grabinger & Amedeo, 1988). Effective learning in a text is based on the amount of interaction with text design, perception and content. The relationships are essential to meaningful learning as indicated in figure 1. According to two different approaches in text density studies, the terms and meaningful learning in text density levels were found to support each other and make connections between two approaches. These connections are given in figure 2.

Chunking separates a sentence into phrases or idea units through the use of increased space or special cues. The aim of the chunking research is to facilitate the connections of meanings among words between actual text and modified text (Grabinger & Amedeo, 1988). Understanding of actual text and modified text may remain as high density and low density respectively. Paragraph organization deals with hierarchical organization and systematic organization. As indicated by Reynolds (1979), "comprehension will be affected not only by the content of text, but also by its visibility and perceptibility and by the verbal capacity and intelligence of the reader" (p. 312).


A
Content
C
B
Text Design
(Computer
Text Layout)
Perception
a. Attention
b. Reading
c. Content
Learning
D

A B C = D (meaningful information in a text)

Figure 1 The Relationship Between Text Density and Perception

Based on the approaches, the researcher has prepared a research proposal to determine the effects of variations of text density levels and cognitive style of field dependence on achievement in a CBI tutorial. For this purpose, CBI versions of the high-and low-density lessons were prepared directly from the print materials which are used to teach a fundamentals of geology course. The final versions of the low-and high-density CBI lessons consist of 145 modified (low density) and 145 (high density) frames respectively. In general, high density text was modified among 35 and 40 percent for each text.

For this study, the CBI version of Low-density text was created by researcher and reviewed by twenty graduate students, and finally validated by faculty members who taught fundamentals of geology course and who are expert in the field of development of CBI tutorials.

High-density text is defined as nominal stimulus that indicates environment (actual text). The difference between nominal stimulus and effective stimulus is based on the amount of information in the perceptual cycle (Neisser, 1976; Grabinger & Amedeo, 1988). For the study, the CBI version of high density text was created by the researcher under the same criteria as low density from the printed materials.

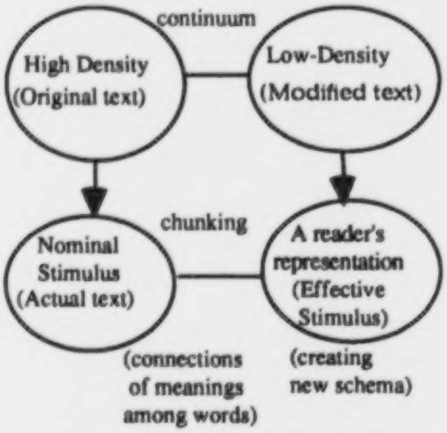

continuum
High Density
(Original text)
Low-Density
(Modified text)
chunking
Nominal
Stimulus
(Actual text)
A reader's
representation
(Effective
Stimulus)
(connections
of meanings
among words)
(creating
new schema)

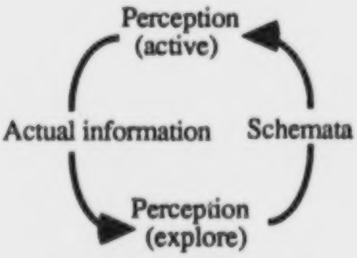
Figure 2 Interaction of Different Approaches in Text Density Levels

Two factors that come into play when talking about text density levels are visual perception and reading skills. Visual perception plays a role in achievement in so far as that the way in which individuals perceive a given set of information will have an impact on how well they can learn from the information which has been presented to them.

Perception time involves different

characteristics, for example, how learners perceive visuals from the text and which activities are most important in an event. The law of proximity in perception and the law of contiguity in memory both indicate that displays and elements which appear close together in space or time tend to be grouped in perception and memory. Display differences can be in terms of the time of presentation, in the spatial location within the display, or in the style or format (Fleming, 1989). As a result, proximity determines just how close in time and space visual images are to appear on the page, television, or computer screen.

The research of text format variables has focused primarily on the attention phase of the perceptual process. But certain limitations are imposed on comprehension when the main text is read from a computer screen because perception is a cycle that reacts to nominal stimulus and effective stimulus (Neisser, 1976). Human information processing as a perceptual style works in this cycle as indicated in figure 3 (Woods, 1984; Gale, 1993).



Adapted from Neisser (1976), Woods (1984), Grabinger & Amedeo (1988), and Gale (1993)

Figure 3 Perception as a Cycle

The process is based on perceptual action as well as readiness for particular kinds of optical structure. The perceptual action consists of three factors: available information (actual environment), schema, and exploration. These factors provide the perceptual cycle, which includes modifies, directs, and samples in this process (Neisser, 1976). Based on these considerations, the "cognitive link between reading and perception is important because it defines a psychological area that may be used to identify processes used by readers in perceiving CRT text and, it sets as a design objective the accurate translation of a nominal stimulus into an effective stimulus" without losing its original idea in a text (Grabinger & Amedeo, 1985).

One of the most important aspects of visual communication is perception. "Perception is often defined as awareness of objects in the environment" (Taylor, 1960, p. 51). Perception is an interaction between the perceiver and the object perceived. Every perception is a transaction. In other words, Fleming & Levie (1984) defined that "our perceptions are relative, selective and organized. Each of these characteristics provides some general guidelines for the designer" (p. 15). Perception deals with awareness of objects in learning environment.

Reading skills are important because the levels at which individuals read affect how they process the given information which, in turn, affects their achievement levels. Grabinger & Amedeo (1988) indicated that "reading, being a perceptual skill, involves not only attending to a stimulus, but also encoding that stimulus in a meaningful manner and cognitively integrating its information with existing knowledge or prior experience for assessing its meaning" (p. 190). Because information in CBI is presented in a format that must be read, reading speed, and reading rate are important learner characteristics in the learning process. Meaning among words must be held constant to manipulate the context of the information presented (Morrison, et al. 1988a, 1988b).

Instructional presentation is based not only on content but also on screen design. Text content determines which information will be displayed on the screen. One obvious question is, what relationship exists between text content and text density? The content must contain a main idea and that main idea must be understandable, readable, and perceptible. The main point is how to design text on the computer screen without losing its original idea.

The functions of technological features in CBI text design are based on the effectiveness of text format variables and content information. Technological limitations in CBI text design can be reduced or manipulated to provide for more effective learning from the CBI lesson. To accomplish this, text format variables can be studied to determine effective text density levels for specific content while retaining necessary details and richness on the text screen. Text format details must be used to help present text with essential words or ideas for learning content information, addressing cognitive processes and assessing the amount of learning from the CBI text screen.

Most text screen design studies, in the literature, have been concerned with reading comprehension. Dole, Valencia, Greer & Wardrop (1991) identified the effects of prereading instruction on the comprehension of narrative and expository text. They found teacher-directed prereading of instructions more effective because, (a) it focused only on the most important information necessary for understanding the text, (b) it included direct and explicit instruction, (c) students are familiar with this type of traditional instruction. Because lesson content needs to be designed in accordance with the media attributes of the presentation medium selected, two points may be important. One is how much information is necessary for understanding the idea, and two, how direct and explicit, the presentation of text information must be. The following pages will discuss these questions.

Reading and Screen Design

Reading speed and learning process on the computer have been discussed in several studies (Gould & Grischkowsky 1983; Haas & Hayes 1985a; 1985b; Hansen, Doring & Whitlock 1978). The cognitive processes of reading and learning work together on the computer screen. It is important to tell that there is a link between reading and learning. The link provides psychological and technological environment to develop an effective CBI screen design. Chunking and a reader's representation of a text structure may vary from individual to individual. These findings suggest that successful format changes reinforce the reading and perceptual cycles (Grabinger and Amedeo,1988). The findings indicate that reading is an important part of screen design process.

Gould & Grischkowsky (1983) found that reading times were longer for subjects who read text displayed on a cathode ray tube (CRT) than for subjects who read the same text displayed on printed pages. Hansen et al. (1978) found that students who completed an examination on a computer screen required more time than students who completed it on printed pages. Haas & Hayes (1985a; 1985b) found that college students required more time to retrieve specific information from texts displayed on a computer screen than did subjects who read the same text on printed pages. Increases in reading time, interests and reading comprehension have been attributed to the unique technological characteristics of the computer display that may influence comprehension by effecting richer interactions between a reader and text (Reinking,1988), and increases in reading comprehension when texts are displayed by a computer may be confounded with readers' preconceptions about reading with the aid of computer (Clark, 1983).

In addition, Kintsch (1980)

indicated how interest is produced in stories. He defined emotional interest which is created through events that tend to arouse the reader; and cognitive interest, which results from certain relations between incoming information and background knowledge. Cognitive interest is related to the degree of novelty in a given text and how well the information can be related meaningfully to other sections of the text or stored knowledge.

Text design in CBI must be based on content information and the selected media (Grabinger, 1983; Grabinger & Amedeo, 1988). In computer text, screens serve as logical units of information. These logical processes pose special problems for designers who wish to present information in ways that help the learning process. In the text, cognitive processes of reading and learning have to work together. At this time, text design elements can help learners by attracting attention and holding interest on the text structure.

According to Hannafin & Reiber (1989), the use of indentation, leading and text chunking strategies appear equally valuable for both print and computer display. However, growing evidence suggests that many design principles are unique to the computer. Factors such as line length and character density of displays, for example, are likely to affect reading speed (Kruk & Muter, 1984).

Although learning remains largely unaffected, other features unique to electronic text, such as scrolling (Merrill, 1982), pixel density, and display resolutions are also likely to influence legibility. Additionally, research on text density (number of words per idea or concept) indicates that low-density text promotes achievement which is at least equivalent to normal text display, but reduces lesson completion time (Morrison et al. 1988b; Ross et al. 1988b). Interestingly however, high-density lesson versions were preferred by learners.

Morrison et al. (1988b) and Ross et al. (1988b) have conducted studies on text density as a contextual variable to test its effectiveness as an alternative method of displaying text on the computer screen. They used a text density strategy to manipulate the richness and detail of the information whereas chunking shortages only changed the display format of the information.

Operationally, the text density construct can be defined by the length of the material (number of words), redundancy of ideas, and depth of conceptual support for the main ideas (Morrison et al. 1989a, 1989b). The decrease in the number of words in the low-density text allowed the designers to make liberal use of white space and vertical typography to highlight and group ideas while maintaining an appropriate level of contextual support on individual screens. Maybe there is a problem with those definitions for measuring those variables. For instance, the questions that how to measure redundancy of ideas or depths of conceptual information in a text are come out.

Chunking was used by Grabinger and Amedeo (1988, 1985), and the manipulation of content was first used by Morrison et al. (1988b) and Ross et al. (1988b). There was a shared point between two approaches, which indicated content without losing the main idea. According to Morrison et al. (1989b), "text density, on the other hand, allowed learners to manipulate contextual properties of the lesson that affected how the lesson appeared rather than chunking the basic information content" (p. 168).

The text density study of (Morrison et al. 1988b; Ross et al. 1988b), can be summarized for presentation modes and text density levels as follows:

1. No differences in learning occurred between low-and high-density groups. 2. The high-density group took 34 percent more time to complete the lesson. 3. Subjects judged the high-density material as slower moving and low-density material as more sufficient than did the print subjects. 4. Comparisons of the full-vs partial-LC (Learner control) conditions indicated no significant differences on achievement, attitudes, or density selections. 5. Reading rate was found to be the only significant predictor of these preferences: subjects selecting CBI were faster readers than those who selected print (Morrison et al. 1989a).

According to the view of Neisser (1976), the cognitive structures are the anticipatory schemata that prepare the perceiver to accept actual information. Because, he further indicated that" we can see only what we know how to look for, it is these schemata that determine what will be perceived" (p. 20).

Messick (1976) identified more than 20 cognitive styles. According to Messick (1976), the field independent person tends to articulate figures as discrete from their backgrounds and can more easily differentiate objects from the embedding context, whereas the field dependent person tends to experience events globally. Similarly, Jonassen (1989) indicated that the field dependent learner views information on the computer screen globally. This definition of field dependence suggests a link between text design, specifically, text density layout, and the cognitive style of field dependence.

CBI developers must understand the various ways individuals perceive and process information if they are to create more effective text and screen designs and thus facilitate the learning process. When learners witness an event, it is likely that each learner will describe a somewhat different experience. Their responses are a result of their individual perceptions which are influenced by differences in gender, cognitive styles, social interactions, interests, achievements, learning styles, and abilities (Witkin, 1976). The individual differences in the ways in which information is organized and processed are known as cognitive styles.

Text Density, Cognitive Style, and Visual Perception in CBI

The literature on computer screen design tends to follow one of two approaches. The first approach focuses on creating effective screen design by means of manipulation of typographical variables. A second approach to computer screen design focuses on the manipulation of the content. Morrison et al. (1989a;1989b) suggested additional variables for designing effective CBI text screens. One is text density which manipulates the context of the information presented, and another is screen density which is the measurement of the amount of information presented at one time on the screen. This paper deals with text density in CBI screen design and how cognitive processes interact with visual format.

By varying text density approaches, Morrison et al. (1989a, 1989b, 1988b) and Ross et al. (1988b) found empirically based data regarding achievement and interaction time that was statistically significant on three of four measures, calculation, transfer and delayed retention.

Grabinger & Amedeo (1988) investigated perceptions of viewers in terms of text format variables covering structure, organization and simplicity. They found that the overall effect of the designs is one of organization. While structure refers to a hierarchical and systematic arrangement, organization refers to a segmented or blocked arrangement. The features of narrow text, double spacing, and organized paragraphs contribute to a feeling of ease, spaciousness, and simple manageable text. As a result, a content analysis of participant descriptions of text types indicates that "different emphasis is placed on different criteria by subjects when perceiving CRT text variability" in the study (p. 203).

A reader's representation of text structure may vary from individual to individual (Grabinger & Amedeo, 1988). This suggests the need for a set of text format design guidelines likely to be based on perception and reading processes themselves, rather than on the effective stimulus alone.

As a result, these questions must be answered to create effective screen design in CBI. What type of text density do students prefer? According to Schultz (1989), students' preferences for text density at 53%, 31%, 26%, and 22% were analyzed. The 31% density screens were preferred, with 26% second, 22% third, and 53% last ($p < .10$). The empirical data seem to support the idea that there is indeed an optimum in screen density. But it does not indicate the amount of interaction between cognitive style and text density. Cognitive style of field dependence is a continuum (Oltman, 1968). Text density was also found as a continuum in learning (Schultz, 1989). Research is needed to indicate an interaction level between two continuum levels. How does the density of text information interact with the cognitive style in the learning process? This question considers an adaptive strategy in CBI tutorial (Ross & Morrison, 1988c). Text density as an adaptive strategy will serve to stimulate more specific efforts to design text display according to media attributes and cognitive styles for CBI tutorial. The CBI tutorial will have personal interests and preferences as well as contextual lesson properties for effective learning.

During the past few decades, cognitive style has been studied to assess its role in student learning. Recently, cognitive style research has turned toward the educational process. According to Messick (1976), cognitive style as information processing describes the learner's typical modes of perceiving, thinking, problem solving, and remembering. He also indicated that each cognitive style has distinct abilities. Each individual has preferred ways of organizing all that he sees, remembers, and thinks about, and these individual differences are known as cognitive styles.

The relationship between the term cognitive style and the term learning style has found different viewpoints in the literature. The term cognitive style has often been used interchangeably with learning style, however, Claxton and Ralston (1978) argued that cognitive style was only a type of learning style. Keefe (1979, 1982), extending this view of a cognitive style as a subcategory of learning style, indicated that" learning styles are cognitive, affective, and physiological traits that serve as relatively stable indicators of how learners perceive, interact with, and respond to a learning environment" (p. 16, 44).

Although relationships between cognitive styles and reading abilities have been studied in some previous research (Hidi & Baird, 1988; Kintsch, 1980; Reinking, 1988), no studies have investigated the relationship between cognitive styles and text density.

Conclusions

The arguments put forward in this paper concerning negative and positive approaches to text density and human factors in CBI screen design in the future of software design and instructional design can be summarized as follows.

To develop text density levels, we need a clear definition of text density in the CBI. Although there are some definitions for the conventional design and for a CBI screen design, there is a lack of definition. For instance, text density would be a summary of content or the amount of perception, or summary of information, or summary of main idea, a number of characters/words or combination of two and more. Because the values for designing rules in text density are so flexible and not objective, but the lack of information can be reduced by testing techniques such as item analysis for text questions in content or text on the screen. The process can provide a support for instructional designers and software designers in CBI screen design.

Research is needed to investigate how learners in different cognitive styles are affected from different text density display according to their reading, comprehension, and perception skills. This considers investigating perceptual views in information processing and individual learners characteristics according to human memory system.

Human-Computer Interaction (HCI) and Computer-Human Interfaces (CHI) are important design strategies for effective CBI screen design. These factors may affect all human senses for creating and producing meaningful instructional materials in their purposes. Because there are three components that include cognitive factors, the computer technology, and user interface. Those factors affect human information processing with respect to human cognitive limitations and hardware limitations.

As a result, text density variations in CBI screen design should be evaluated and created according to needs in instruction and learning, such as interests, learners characteristics, HCI strategies, human cognitive limitations and measurement techniques.

Summary

This paper has addressed variations of text density levels of CBI screen design from the standpoint of chunking and manipulation of content information approaches. The structure of text density considers both the components of screen design and the elements of human information processing as a perceptual style that deals with using technology and understanding learner characteristics.

Sophisticated CBI screen design, well designed format variables with text, and quality software design would be possible with using human-computer interaction strategies and understanding of individual perceptual skills for both novice and experienced users according to cognitive limitations and technological limitations.

Meaningful information occurs when the interaction is provided from the intersection of text design, content and perception. The interaction indicates the relationship between text density and perceptual cycle. Information processing as a perceptual cycle presents an attention and interests levels for learners in CBI. The visual perception shows how visuals deal with human eye movements in CBI screens.

Finally, text density variations of CBI screen design are affected from human cognitive limitations and technological limitations. Those effects are based on different visual perceptions and HCI strategies, and different user interfaces.

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Needs Assessment - A Savvy Way to Secure ITV Use

Indrani Ganguly

Since I come from India which is the world's largest documentary and film maker, I have an instinctive attraction to visuals. This has led me to examine more closely the concept of visual learning. It did not take me long to discover that although most Americans show a high level of immersion in television, the same medium failed to enthuse classroom teachers to any noticeable degree. Teachers were so desperate for students to acquire computer literacy through languaging, graphics, simulations, and computer based instructions, that instructional television (ITV) only got a brief passing nod. Educators were often heard favoring a non-linear electronic program (such as the Hypercard) over a linear one, as if one was inferior to the other, thereby justifying their stand on constructivism and other jargons. Thirty years earlier, similarly, educators had made boisterous promises with equal ardor on television's potential to create wonders in the school curriculum. The trend of this situation reminded me of George Leonard's thoughts that, "......we must see technology as an ally, a force that can as easily enhance as diminish the human spirit" (Gilliom & Zimmer, 1972, p.6).

The two major national surveys on the use and utilization of ITV, one completed in 1977 and the other in 1983, indicated a 33% and 29% usage rate respectively (Riccobono, 1985). Today, ITV use remains rare; only 37.9% of the nation's teachers perceive media materials as adequate supports to instructional objectives (The National Center for Educational Statistics, 1993). This despite the Carnegie Foundation's Agenda for the Nation:

"If America hopes to achieve its first educational goal, television must become part of the solution, not the problem. Inaction can no longer be tolerated......"(*A Mandate for the Nation*, 1990).

Several valid reasons have prevented ITV from gaining a foothold in classroom teachers' instructional repertoire. The most prominent among these have been: 1) the myth of television's image as a medium for passive viewing; 2) the overemphasis on computers (in the parlance of educational technology); 3) the puerile research attempts on television's effectiveness over traditional teaching methods; and 4) non-compliance with the participatory design principle in developing broadcast materials. Additionally, over the last forty years of its existence, ITV has assumed differing images in order to respond to the exigencies of American education (Cambre, 1987). The "master teacher" image of instructional television of the late 1950's, followed by the "you are there" image of the late 1960's, the "entertaining but softly instructional" image of the seventies, and finally the "dramatized and fast paced" image of the 1980's, all touted ITV's ability to create wonders in the school curriculum.

Unfortunately, the planning and purpose of ITV use was driven all along by a clientele outside the classroom, largely unseen by the teacher. The inside change agents of this innovation, namely teachers, had little knowledge of what they would have to deal with and how they would make room for the TV-teacher in their lesson plans. To fulfill ITV's goal of purposeful instruction, this spot innovation should be removed to better integrate television into the total instructional system.

In many industrialized countries, as in the United States (U.S.), the aspirations of the educational institutions have been molded by the needs of business and industry. The pressing belief that if schools did not take into consideration students' future workplaces, pupils would be educationally handicapped, has prompted educators to quickly revamp school curriculum to enable students to have better life chances. As a result about 350,000 microcomputers that gratified students and teachers alike with their non-realistic images of line drawings, schematics, and graphics through CAI, CBI, and simulations, were introduced into American public schools over a short four years (Campbell, 1984). Everything would have been fine except that the adequate training of teachers lagged behind the trend.

A survey conducted by the American Association of Colleges for Teacher Education (1987) indicated that only 20% of teachers entering the profession perceived themselves to be prepared to teach with computers (Hasselbring, 1991). Further, the software that typically dominated the classrooms, such as drill and practice, tutorial, and simulations and programming approaches were too deterministic and biased against experiential learning (Streibel, 1986; Shane, 1987; McClintock, 1986; & Budin, et al., 1987).

Thus, before computers could qualify as an effective instructional tool, they were hurled into the educational arena to create a symphony with the so-called computer culture of the work life. As Apple said, "There is a partly hidden but exceptionally close linkage between computers in schools and the needs of management for automated industries, electronic offices, and "skilled" personnel." (1988)

On the other hand television's inclusion in school curriculum has faltered because of its 'couch potato' image in viewers' minds. Television's excessive alliance with the American people's domestic lives has diminished its potential as a vibrant educational aid. However, according to educational psychologists, the more senses that are engaged in the learning process, the better will be the information processing and retention.

Television's capacity to simultaneously transmit three general coded types of information - digital, iconic, and analogue - offers the maximum scaffolding to sensory experiences so vital to meaningful learning. Visual learning is the first step to conceptual learning - the same pathway a child follows to extort meaning from the real world, iconic, then digital.

At this point, we must not combine the iconic (visual) and digital (language and thinking) stimulii, so as to note their distinct features. Streibel (1985) said, "Visual images are implicative and incapable of propositional form. Such images are therefore unable to serve as digital atoms of conventional language."
Eisner (1993) goes one step further in distinguishing visual from digital learning by suggesting that visual images send out messages instantaneously, and function as synchronic media. On the other hand, language as a medium carries a message over time. Viewers construe their own meanings in the light of their cognitive styles through a process of selection from the displayed visuals. The stream of visuals offered by television contains symbolic features that engage learners in assimilating reality into their own schema. Piaget (1971) explained this mental process in children as an active, internalized, schematizing process. Salomon's (1979) ideas on visual supplantation parallel Piaget's in framing visual thinking as an internalized schematizing process. The verbal information that accompanies the visual elements in a TV genre serves to link concepts and labels together. Television has the capacity to provide a spatially continuous set of experiences that is richer than unsystematic exposure to stimuli in everyday life. So the myth that television is a passive process is incorrect because active covert manipulations can be triggered in learners from viewing television.

The third factor that has hobbled ITV's progress since the initial flurry of excitement in the seventies was the premature application of summative research models that overlooked the natural range of variables so integral to this non-coercive and impressionistic visual medium. The overemphasis on scientific validation of results in an empirical set-up limited the scope of theoretical progress, as related to television and learning. (Summative research presupposes a hypothesis, that connotes that results are limited to either acceptance or rejection of the hypothesis). For about two decades (1950-1970), research on comparative effectiveness formed the bulk of the summative research. Most studies found "no significant differences." Only a handful of basic research was concerned with the effects of production variables and learning. In his doctoral dissertation Stickell (1971) reviewed 250 studies on comparative effectiveness and found that 217 of them had committed methodological sins, and only 10 could be interpreted. (Here the reader should note that research methodology is the theory and the interpretive framework that guides a particular research project; method refers to the technique for gathering empirical evidence (Harding, 1987).) Many writers doubted the results of comparative effectiveness studies further by expressing disbelief about the method, stating that there were too many uncontrolled variables to make the studies truly empirical.

The final fault with ITV has been the exclusion of teachers in product design (Schramm, 1977). Utilization of instructional television is a complex process which starts with funding agencies - typically government sponsors, since instructional television markets have generally been unattractive to investors in the private sector. Professionals at various levels then become involved, with teachers brought in last. In order for ITV to be used effectively in classrooms, it must be pedagogically dependable, convenient, and effective - teachers need to be able to control when and how the instructional media will be used; thus their input is necessary. A team effort by principals, superintendents, media specialists, curriculum experts, and teachers is critical for proper implementation of ITV. Vernon Bronson, one of the early theorists of educational technology, advocates the employment of participatory design which brings together technological designers, content specialists, classroom teachers, and others into the development of programs. The idea is to combine the specialties of experts into a coordinated instructional whole (Hall, 1978).

Research studies on ITV over the last forty years have examined the theoretical aspects of television as a medium for instruction, and how the major chunk of the research is focused on media comparisons and their competing advantages. Media comparison studies, regardless of the media employed, tended to result in "no significant difference" conclusions (Mielke, 1968). Most current summaries of media comparison studies clearly suggest that media alone cannot influence learning under any conditions. Even though dramatic changes in achievement were seen in schools in El Salvador (Schramm, 1977) after the introduction of ITV, it was not the medium itself that caused the changes, but the accompaniment of curricular reform. True acceptance of ITV within classrooms requires television to be taken out of its normally isolated role and adapted into schools' instructional systems. This necessitates the investigation of several problems, such as: 1) Is the in-school use of ITV punishing to the user? 2) Are there adequate support personnel to help teachers use ITV, and to know about the program sources? 3) Do teachers have access to video equipment? and 4) Does a teacher care if ITV is used? Since evaluative research is the key to future decision making, this study purports to probe the beliefs and expectations of teachers for ITV use in science teaching in a systematic way.

ITV - The State of the Art

According to Toffler (1980), technological innovation requires the support and concern of the human clientele who use it. The inclusion of the values of all educational partners (learners, teachers, parents, and community) is essential in the planning process to avoid intuitive and spot-innovations. A major component of socially directed innovation policy is the participation by community groups (operating from the public sector) in the product design and development process (Mole & Elliot, 1987). The entry of television into the educational arena was need-driven at the very outset, - as such, it was a socially directed innovation. The needs were twofold: to cope with the teacher shortage in the post-World War II era and to double the effectiveness of "master teachers" in serving as examples to ordinary teachers who needed to improve their own performances. The functional purpose of ITV was tied to solving the short-range problem of teacher shortages, which not only has disappeared, but has also reverted to a teacher surplus. Further, the implied message that television teachers would do a better job than classroom teachers has left a permanent scar in the minds of teachers, thereby alienating them from the spirit of the innovation (Friedlander, 1975).

Proponents of ITV would be more

successful if they used the intervention model, described by Mole & Elliott (1987). This model prioritizes the needs of the human clientele it serves. In order to serve the goals of education--the largest industry in the United States--all people involved must make concerted efforts to solve potential problems. For instance, there is the need to decide whether to go with the economy and quality of centralized broadcasting over a large area, or the educational and psychological advantages of local control of instruction in the classroom (Schramm, 1977). If the experiences offered by high quality, nationally funded programs pose problems for the teacher, or the level of treatment exceeds the mental age of the intended audience in a classroom, then much of the quality is wasted. Hence, one solution lies in avoiding the naive ways of launching an innovation that hinder its growth and acceptance. This may be done by taking into account the needs of the teachers who are responsible for implementing ITV in the classroom (Gray, 1976; Smith, 1978; Schramm, 1977; Gayeski, 1989; Warran, 1991).

Needs Analysis in Technological Innovation

In Webster's dictionary, need is defined as the physiological or psychological requirements for the well-being of an organism; a condition requiring supply or relief. It is also generally understood to indicate a state or condition, as in Maslow's (1954) hierarchy of needs from the physical (the lowest level of survival) to self-actualization (the highest level). There are two common uses of the word, "need" (Witkin, 1984). In one, need is used as a verb, as in "We need oxygen." In the other, need is used as a noun, "Jim has a need for improving his reading performance". When need is used as a verb, the remedial solution is already suggested to the need. When used as a noun, need can be operationally described as a discrepancy in a problem. Kaufman (1988), Heath (1985), and Beatty (1976) have utilized the discrepancy definition of need - a gap between current and desired conditions.

Heath (1985) identified three types of needs assessment models that conform to the aforementioned needs. The *discrepancy model* of needs assessment focuses attention on the degree of discrepancy. In the *demand model*, potential clients are surveyed to elicit their "felt needs". Respondents are encouraged to express their needs rather than to demonstrate their deficits. Finally, the *dialogue model* has been proposed to insure a sustained interaction between investigators and clients. In this research, a combination of the discrepancy and the demand model was employed to discover teachers' perceptions of ITV implementation. If ITV is to be successful, the distinction needs to be made between a mass audience and specific target audiences, and this information must be conveyed to funding agencies, administrators and producers. According to Kozma (1986), television for education must cause learning in individual viewers. This statement should create an awareness that the attraction of a mass audience is **not** the primary goal of televised instruction. Instead, instructional television is defined as the application of television technology to purposeful instruction. Tyler (1971) concluded that expected behavioral gains on the part of the learner should testify to the attainment of program objectives. In reality, however, producers lose sight of the needs of the target audience in their concern to attract a larger audience; so they often sacrifice the instructional effectiveness of programs.

The notion of a needs assessment for a target audience needs to be considered more seriously in view of this country's decentralized educational system. In the U.S., unlike England, Japan, France, and some other developing countries, there are no uniform curricular standards from school to school, from district to district or from state to state. This lack of uniformity makes it difficult to implement model instructional television programs across districts, and on different grade levels. The size of the decentralized systems makes "education" an abstraction (Bosner, 1976). So, one particular set of program objectives cannot be claimed as educationally appropriate. Within the environment of the classroom, program content needs to be directly related to teachers' lesson plans in order to establish a cohesive bond between teacher objectives and program content.

The ultimate success of a production depends on its psychological effects, and not on the medium itself. Studies that examined the effectiveness of different media have shown repeatedly that no learning benefits are gained from employing different media--what matters is the method, aptitude, and task variables of instruction (Clark, 1983; Salomon, 1978). Consequently, a theoretical base must exist to fulfill the above instructional criteria. As part of inservice programs on TV utilization, Maccoby and Comstock (1965, cited in Wade, 1969) designed an experiment which involved two types of preparation and follow-up to be used with television: Socratic and Teacher-Tell. The Socratic method emphasized active teacher questioning, and correction of student responses, and the Teacher-Tell method was a mere iteration of TV content for students - one a brief synopsis to prepare them for TV lessons, and the other, a summary for when the lesson was over. Wade experimented with the Maccoby-Comstock hypothesis in a two-way ANOVA design and found significant learning gains in students utilizing the Socratic method over those in the Control and Teacher-tell methods.

When so much depends on the message in the medium, and on its utilization by the classroom teacher, one clear way to decide the effectiveness of programs is to consider viewer needs. Since ITV is used in formal classroom settings, where the beneficiaries are students, the expectations and input of teachers should be incorporated into decisions on program development and utilization. Sound curricular decisions are usually dependent upon two sets of influences: 1) general and theoretical and 2) practical and pragmatic. The first set considers television in light of society, knowledge, and learning; the second one addresses the state of ITV programming, the availability of supplementary delivery systems, and the utilization strategy. The pragmatic influence requires an assessment of the needs of the teachers who will make meaningful contributions to ITV's functional aspect. The literature on the relationship between teacher needs and ITV utilization will help offer a baseline as to the nature of the connection.

For instance, the attitude of principals toward the use of ITV in schools can greatly determine the extent of utilization. Approval and recognition by principals was deemed critical to its inclusion in classrooms (Klasek, 1976; Driver & Bracey, 1980). Keller & Johnson (1982) made tentative conclusions concerning the differing variables which influence the utilization of ITV. Using a forward-stepping multiple regression design, the researchers found that the amount of ITV use by teachers greatly depended on their past and present dispositions toward the medium and on the number of favorable conditions derived from its use. The experience of teachers correlated negatively with ITV use, with less experienced teachers as somewhat heavier users. The availability of equipment along with newer capabilities, like recorded video programs, slightly affected the usage rate of ITV. In the cross-tabulated data of the Maryland instructional television study final report (Johnson & Keller, 1981), school type was also shown to have a strong relationship to ITV use. It was found that elementary schools were heavier consumers than middle/junior high schools, and the latter in turn used more programming than high schools.

The overview of the survey research on ITV (Dirr & Pedone, 1979; Crane, 1981; Maftoon, 1980(cited in 1982); Warran, 1991; Riccobono, 1985; Mercer, 1980; Keller & Johnson, 1982; & Patterson et al., 1993) reveals that broadcast scheduling, inadequate availability and accessibility of equipment and materials, lack of administrative, parental and student support, and lack of coordination with media specialists have been major deterrents to its use. Additionally, most elementary teachers regard ITV as an isolated piece that has no connection to other activities in the classroom. Consequently, the purpose of this research was to identify factors affecting ITV's usage rate for teaching science, and to determine the "felt needs" of teachers that must be satisfied to warrant additional use.

Research Questions

A needs assessment survey of science teachers in fifth through twelfth grades in the state of Ohio was conducted to answer the following research questions:

1. What factors influence science teachers positively or negatively toward using instructional television?

2. What are the significant needs felt by science teachers in the actual classroom regarding ITV use?

Methodology

A target population survey on teacher needs and expectations were given to science teachers to uncover their perspectives on the most effective utilization of ITV. A survey instrument was constructed and validated to collect information. The first part of the survey consisted of items related to ITV utilization. The second part requested demographic information on teacher characteristics. The study was descriptive and included ex-post facto analysis of the effects of certain teacher characteristics on the opinions and stances toward ITV.

Sample for the Needs Assessment Survey

The sample for this survey research consisted of Ohio science teachers (5-12 grades) who were affiliated with the Science Education Council of Ohio (SECO). Surveys were mailed to 960 teachers. Incorrect addresses reduced the size of the target population from 994 to 960. Surveys were mailed with two cover letters: one from the researcher and department directly involved in the study and the other from the past president and membership chair of SECO. The survey instrument and the cover letters are available upon request.

Data Analysis

After nine weeks, two-hundred-sixty responses to the survey were received. This represented 27% of the target population. To evaluate the representativeness of the sample, a profile analysis was performed to compare the distribution of gender, age, grade levels taught, and geographical location of teachers among the respondents with those of the non-respondents. The sample consisted of 140 female, and 120 male teachers. Of these, 98 were physical science teachers, and 133 were life science teachers. There were 39 teachers in the first age group (22-35), 163 in the second (36-50), and 46 in the third (above 50) age group. The teaching experience of these teachers ranged from 1 to 50 years.

Cross-tabulated Chi-square analysis was used to test whether the sample matched the population on the above four demographic characteristics. The first step of the data analysis was a Principal Component Analysis to reduce the 31 items of the first part of the instrument to meaningful clusters. The sample size for reliable factors suggested by Stevens (1992, p. 384) requires more than 150 for any analysis. Stevens states that for social science research, at least 150 subjects for components with 10 or more low loadings will be reliable. Also, components with four or more loadings above .60 in absolute value will be reliable, regardless of sample size. The data from 260 subjects used for this analysis were believed to yield reliable results. The internal reliability of the factors obtained were estimated using Cronbach's alpha. Next, the effect of teacher characteristics (gender, age, grade levels taught, and teaching experience) on the factors extracted were examined through four separate multivariate analyses of variances. Significant multivariate F-ratios were followed by univariate tests in the case.

The second step in the data analysis used a repeated measures multivariate analysis of variance on the single group of subjects in a "One-Within" design. The within-subject factor was the social conditions of "ideal" and "actual". The set of factors yielded by the principal component analysis of part A of the instrument constituted the dependent variables. The difference variables created measured the need or discrepancy between the ideal and actual conditions using the same group of subjects for the two sets of responses. The sphericity assumption was tested by Greenhouse-Geiser and Hyunh and Feldt epsilons in order to control for bias in the univariate tests that followed the multivariate tests. The purpose of this analysis was to determine the significances of the "felt needs" of science teachers on the variables identified through the principal component analysis. Here again, the sample size of 260 was adequate for small effect sizes to have a statistical power of .80 (Stevens, 1992).

The significance of the Chi-Square statistic was greater than .05 level, across gender, subjects taught, and geographic location. Hence, the null hypothesis could not be rejected. In other words, there was no significant difference between the sample and the population on any of the above three demographics. Across school type of teachers, the Chi-Square statistic was found to be $p < (0.012)$. Since this was less than the .05 level, the null hypothesis was rejected. In other words, there was a significant difference between the sample and the population on grade levels taught alone.

Factors Influencing Teachers

The first research question addressed by this study was, "What factors would influence science teachers positively or negatively toward using ITV?" Two approaches were used to answer this question. First, a factor analysis using principal components analysis with varimax rotation was performed on the responses to the "actual" column of part A of the survey instrument. The result was used to construct eight subscales which clarified the interpretation of the responses. In addition, descriptive statistics were used to compare the factors that were ideally viewed by teachers, as opposed to those perceived actually in the ongoing classroom environment, and to come up with the discrepancy between these two conditions that led to the assessed need.

A factor analysis of the 31 items describing teachers' beliefs about ITV was performed to identify the subscales embedded in the instrument. The principal components analysis (Table 1) reduced the 31 variables to 8 factors (or subscales) that would closely fit the pattern of the observed correlation matrix. The value of a good principal component analysis is that it indicates a close fit between the observed and reproduced matrices (Tabachnik and Fidell, 1983; Stevens, 1992). The purpose of varimax rotation (a form of orthogonal rotation) is to make the interpretation of factors most obvious by maximizing the variance of the loadings across variables within factors. This method was employed to the extracted factors. In orthogonal rotations the factors are uncorrelated; the solutions offer ease of description and interpretation of results. Varimax rotation was deemed appropriate in view of the low correlation found in the original factor matrix. The cut-off size of loading was set by the researcher at .45, instead of the general rule of thumb which considers loadings in excess of .30 for interpretation. The reason was to avoid non-chance loadings and to secure greater overlapping between a variable and a factor. Hence, the minimum factor loading considered for interpretation would account for at least a 20.25% overlap in variance between the variable and the factor.

Based on Kaiser's and Cattell's recommendations, the analysis yielded twelve factors with eigenvalues greater than 1, and approximately 8 factors before the break-point in the scree plot. Hence, an eight-factor solution was retained for interpretation, along with three stand-alone items from the remaining factors, because of their unique nature, and their relatively high loadings. Thus, the resulting eight factors and three unique items described the facets of teachers' beliefs about ITV use, and explained fifty-three percent of the total variance. The three stand-alone items which had high factor loadings were retained as unique dimensions accounting for beliefs of science teachers. These items were:

Item 1: The program uses background music.

Item 2: The program is narrated by a woman.

Item 3: Smaller class sizes needed for effective use.

Even though item 14, "Other science teachers in my school believe that the instructional television program is worthwhile before I would use it", did not load in factor eight, it was placed there because it logically associated with the category of "External Approval."

The second part of the survey instrument provided information on

Table 1.-- Summary of Principal Component Analysis

Factors	Items	Eigenvalue	% Var.	Loading	Cr.-Alpha
Relevant & Accurate	4	5.64	18.2	.57-.73	0.73
Entertaining	4	1.97	6.4	.46-.81	0.67
Instructional Support	3	1.81	5.8	.68-.69	0.62
Teacher Involvement	3	1.63	5.2	.61-.79	0.67
Accessibility	3	1.43	4.6	.56-.74	0.57
Focus	2	1.38	4.5	.75-.78	0.67
Availability	2	1.34	4.3	.53-.65	0.31
External Approval	3	1.26	4.1	.68-.78	0.43
Total	**24**		**53**		

Table 2.-- Multivariate Test for CONDITION main effect

Test	Value	Exact F	Hyp DF	Error DF	Sig. of F
Hotelling	5.485	118.665	11.00	238.00	.000

teachers' personal characteristics, such as gender, age, teaching experience, subjects and grade levels taught, and amount of media training. Responses to these were analyzed to discover the impact they had on the factors influencing teachers' ITV use (through four separate MANOVA's).

Significance of Teachers' Felt Needs

The second research question was; "What are the significant needs felt by science teachers in actual classrooms regarding the use of ITV?" Here, need was assessed as the discrepancy between teachers' belief of ideal and actual standpoints. A multivariate "totally within" design was used, where the same subjects responded to two distinct social conditions (ideal and actual) across eleven dependent variables. This analysis was conducted to determine if the discrepancies between "ideal" and "actual" states were significant across factors. The results of MANOVA (Table 2) on condition (ideal and actual) main effect shows significance at .05 alpha level. However, it is necessary to probe if the sphericity assumption is met to guard against any bias in the univariate tests. The average of Greenhouse-Geisser Epsilon and Hunyh-Feldt Epsilon was 0.60133, showing that sphericity was not tenable with epsilon less than .70. Since the minimum epsilon was .091, this departure from sphericity was not severe. By utilizing the Bonferroni approach that controls the overall alpha to remain .05 across variables, the needs still

Table 3.-- Univariate Tests for Within Subject Effect (N=249)

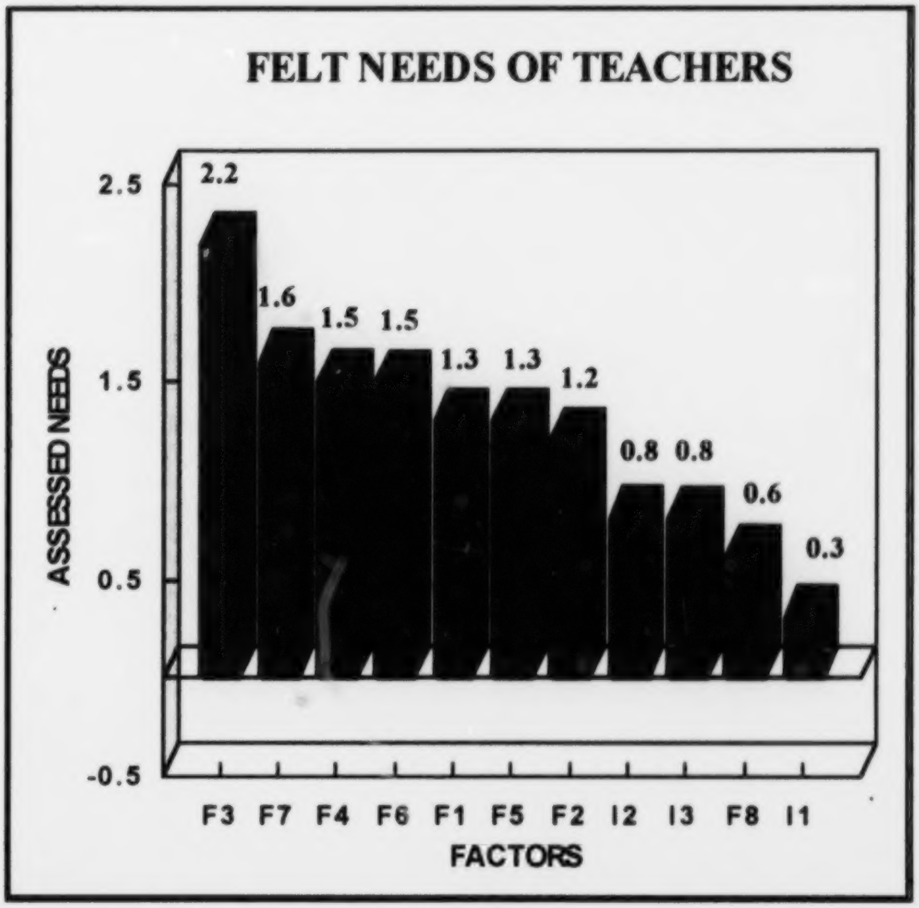
Need(Ideal,Actual)	HypSS	ErrorSS	HypMS	ErrorMS	F	Sig
Fac1 (4.5, 3.3)	204.50	76.04	204.50	.307	667.1	.000
Fac2 (4.2, 3.0)	176.10	77.66	176.10	.313	562.4	.000
Fac3 (4.2, 2.1)	579.70	168.60	579.80	.680	852.7	.000
Fac4 (4.3, 2.8)	283.10	178.30	283.10	.719	393.7	.000
Fac5 (4.7, 3.5)	183.30	132.80	183.30	.536	342.4	.000
Fac6 (4.2, 2.7)	265.30	129.80	265.30	.523	506.9	.000
Fac7 (4.1, 2.5)	322.80	168.80	322.90	.681	474.2	.000
Fac8 (3.3, 2.7)	38.61	84.11	38.61	.340	113.8	.000
Item1 (4.0, 3.7)	12.53	92.97	12.53	.375	33.43	.000
Item2 (3.4, 2.6)	69.47	188.50	69.47	.760	91.38	.000
Item3 (3.3, 2.5)	81.13	254.40	81.13	1.03	79.1	.000

continue to be significant as indicated by the significance of .000 in Table 3 (Stevens, 1992, p. 454). The above information led this researcher to conclude that the assessed need as a discrepancy between the ideal and actual social conditions was significant on each of the eleven factors at .05 alpha level. A bar graph has been provided on science teachers' "felt needs" along the eleven subscales or variable (Fig. 1).

Discussions and Recommendations for Future Research

The sample profile was consistent with the population in gender, teaching experience, and age. This consistency permits generalization of results to a similar population. The sample profile showed a discrepancy only with the population on school type (middle or high school) and revealed a greater number of responses from high school teachers than from middle school ones.

Relevance to specific content area was the first strong criteria for teachers' use; this result mirrored earlier studies (Warran, 1991; Broussard, 1976; Cambre, 1987 & Mercer, 1980). Close behind was the notion of "entertaining." Mielke and Chen (1983) claimed that science content need not be minimized for the presentation to be entertaining. In fact, the formative research on the series 3-2-1 Contact noted that due to educational and entertainment value, it was given sustained use by teachers. The third factor, "instructional support", continued to stress media resources (video-by-learning objective database) and inservice training for teachers.



F1-Relevant & Accurate F2-Entertaining F3-Instructional Support
F4-Teacher Involvements F5-Accessibility F6-Focus
F7-Availability F8-External Approval
I1-The program uses background music I2-The program is narrated by a woman
I3-Smaller class size for effective ITV use

Figure 1. Felt Needs of Teachers

Since 52% of teachers in this study reported receiving some undergraduate media training, the situation qualified as improved, relative to national survey findings of only 33.3% receiving such training (Riccobono, 1985). The next factor, "teacher involvement" (with a mean score of 2.8) showed a marked impression by teachers that their views were not incorporated into the production of programs. As proper use of television demands an active teaching style, this factor was perceived an important one. Previewing of programs was deemed essential for appropriate lesson planning, and teachers' ITV use could be negatively affected if support staff or equipment were not in place (Willis, 1978; Schneller, 1977; Harbison, 1989; & Forsslund, 1991).

Teachers rated "accessibility" and "availability", the next two factors of the same ilk, just as important as in earlier studies (Broussard, 1976; Jones, 1986; Mercer, 1980; & Maftoon, 1982). The factor mean score of 2.7 (actual) on the next factor "pedagogical focus", showed that teachers did not believe that programs had a clear objective and gave didactic cues for viewer responses. Teachers believed that programs could be more interactive by offering proper cues to viewers rather than in just presenting a magazine format. Finally, the mean score of 2.7 (actual) on the last factor, "external approval," showed such approval was not present in real life, nor was it necessary as science teachers regarded it of little importance. This factor contributed to only 4.1% of the total variance, suggesting that science teachers may be autonomous and isolated in their decision making about using ITV.

The influence of teacher demographics, as tested by MANOVA, yielded a significant difference only for school type on the set of eleven factors influencing teachers. However, this effect size was very small (of the order of .1 with power .88), so its practical significance was negligible.

It is clear from the results of this study that what schools set out to do, and what actually takes place do not converge. The significance of needs along each of the eleven variables of ITV use document serious gaps in technological innovations. Due to the loose logistics of the utilization process, educators easily give up the technological reform, showing little allegiance to the whole effort. Cuban has described this attitude of policymakers as a cycle of enthusiastic response, subsequent disappointment, and ultimate non-use of the media (1986). Since efforts to improve education in America come from four political fronts (the Establishment, the Standards Movement, the Technological Movement, and the Choice Movement) (Carlisle, 1993), there needs to be a balance so as to fulfill desired standards with minimum conflict.

Recommendations

1. Future research can use more of the variables that underlie each of the factors enumerated in this study.
2. Teachers' preferences about program time lengths, number of topics in a program, and the nature of the pedagogical approach, such as demonstration type, enrichment learning, or cross-curricular applications of science, need to be determined in future research.
3. Since visual messages have implications for procedural requirements in a learning system, future research needs to assess teachers' awareness in this area.
4. Studies should determine whether producers of ITV solicit teacher input in program production and planning in keeping with the participatory design principle.

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A Reader-Response Analysis of *A Book from the Sky*

Yan Ma

Introduction

This study applies reader-response criticism to investigate subject positions of gender, age, ethnicity, and profession through a poststructural analysis of an art work entitled *A Book from the Sky* (hereafter referred as *Book*). This study examines the relationship between and among viewer, text (the art work), and artist. It explores the relationships between and among subject positions of viewers, text, and historical moments of viewing, and investigates how the art work positioned viewers in the social change and meaning construction. Since the *Book* possesses political, social, and cultural values, the study is a postmodern educational enterprise. The study is also a contribution to postmodern art education. For the purpose of the study, both textual analysis and social science research methods, such as survey and interviews, were used.

Description of *A Book from the Sky*

In his essay *The Work of Art in the Age of Mechanical Reproduction*, Walter Benjamin (1936) described a crisis that occurred in the late twentieth century. He warned that the originality or the "aura" of an art work had been lost because of mass production in the industrial society. The late twentieth century has witnessed the innovations of technology ranging from telephone networks, communication satellites, radar systems, programmable laser videodiscs, robots, biogenetically engineered cells, computer networks, rocket guidance systems and to artificial intelligence. Bill Nichols (1988) has carried Benjamin's inquiry forward as he describes the mass production in the age of cybernetics. The aura of a cultural product has been lost in mass production of copy machines, computers, etc. Although critiques of art works based on the ideas of Benjamin and Nichols have been carried out in the West, Eastern scholars have not articulated these ideas. An ambitious work of art, however, has appeared in China and it incorporates both of Benjamin's major topics, namely, the aura of an art work and the nature of mass reproduction with letterpress printing.

The art work is entitled *A Book from the Sky*. One copy of the *Book* consists of four volumes each 40 cm x 36 cm. The *Book*'s format resembles that of Chinese holy classics. The artist, Xu Bing, spent three years making the volumes. The characters in the *Book* are made up, designed, carved, and printed by the artist. They look like real words but they are not real words. The artist has created a totally "new" language, by combining traditional Chinese printing with book-making. He kept the aura of original art by creating more than four thousand individual "characters," the method of printing applied and the number of copies printed are related to the concept of mass production discussed in Benjamin's essay. The artist used letterpress printing to print one hundred and twenty copies of the *Book*. When it was exhibited, it was installed in three fashions: thread-bound books, ceiling draperies (an exaggerated form of a Chinese scroll), and wall hangings (an exaggerated form of Chinese painting on walls).

Artist Xu Bing, spent three years making these unrecognizable characters during the time when China was opening its door to the rest of the world; allowing the flow of Western ideas into China; accepting and rejecting ideas and philosophy of old and new, Eastern and Western, traditional and contemporary in a mixed condition. As Erickson (1991) pointed out, "denying the meaning of Chinese culture by deconstructing the written word has political overtones in itself. It echoes young Chinese intellectuals' frustration with a system of culture tightly constrained by the authorities and questions the validity of a civilization that could produce such a situation" (p. 12).

The appearance of the *Book* in China spurred reaction from art circles and other viewers as well as reactions from other countries in Asia. Viewers with different social, economic, political, educational, and cultural backgrounds reacted differently to this *Book*. The *Book* was praised highly and discussed heatedly in China before the Tiananmen Square incident on June 4th, 1989. From 1985 to 1989, there was a new trend in Chinese art which was labeled as the "New Wave of Fine Arts." Art works influenced by the New Wave were similar to Western art in style or conceptualization. After the June 4th incident, the government set a policy to control arts. The *Book* was criticized by some conservative critics as an example of the product of "bourgeois liberalization" during the "New Wave" (Yang, 1990).

The *Book* is deprived of the standard means of communication: reading. Though it is considered a book in its form and format, it resists reading. Because it resembles a real Chinese book, it invites viewers to read, understand, and interpret, but its characters are simply art forms. It was presented to a United States audience during the period from 30 November 1991 to 19 January 1992.

The *Book* is a challenge to viewers not only visually but also culturally. It challenges viewers to rethink the meaning of language and the relationship with its culture.

The general concern of this study is "What meanings do viewers with different ethnicity, age, gender, and profession construct from viewing this *Book*?". The study compares the similarities and differences of the interpretations given by United States viewers (novice viewers) and Chinese critics (expert viewers); ascertains the author's intention in making this *Book;* compares his intention with viewer reactions; and describes the codes in the

Book. Because the investigator has available only the critiques written by Chinese critics, these critiques are used for comparison.

Objective and Focus Questions

A number of focus questions are related to the objective of the study. Following are the objective and focus questions for the study:

Using reception theory to compare and contrast between and among the artist, the *Book* itself, and the viewers, the researcher asked the following focus questions:

1. What is the intention of the artist who created this *Book*?
2. What are the codes in the *Book*?
3. What meanings are constructed when viewers interact with this *Book*?
   3a. How do Chinese critics react to this *Book*?
   3b. How do the United States viewers react to this *Book*?
4. How do the Chinese critics' perception of the codes compare with the United States viewers' perception of the codes of the *Book*?
5. What are the similarities and differences between and among the intention of the artist and the interpretations of the Chinese critics and the United States viewers?
6. What are the similarities and differences of the interpretations generated by the United States viewers from groups differing in gender, age, and profession?

Methodology

In order to examine the research questions stated earlier, a research design, which consists of personal interview, survey, and a poststructural analysis using reception theory to analyze collected data is developed.

Interviews are used to gather responses from viewers of the United States. Interviews are used to ascertain the intention of the artist who created the *Book*.

Survey is used in case there are more viewers than the investigator could handle at one time. A questionnaire is mailed only to those who have been to the show and whose gender and age group are known to the investigator in order to avoid sensitive questions. Therefore, this group of respondents are those whom the investigator personally knows.

Textual analysis is used in this study. It consists of the analyses of the text (i.e., the *Book*); the critiques of Chinese critics; the transcriptions of interview and questionnaire of novice viewers, and the artist interview transcription. Chinese characters are the symbols of Chinese culture. When the cultural symbols are deconstructed and reconstructed into familiar but new symbols, how do people of different ethnicity, age, gender, and profession construct meaning when they are interacting with these new symbols (in this case those in the *Book*)? As DeVaney (DeVaney & Elenes, 1990) pointed out "A post structural textual analysis has the power to answer questions about cultural meanings." Codes or syntax of the *Book* are analyzed because a close textual analysis is of primary importance to a further analysis of the relationship between and among text, reader and artist. The textual analysis of the *Book* consists of the following elements: codes of Chinese language, codes of Chinese characters, codes of classic Chinese books, and codes of installation of the *Book*. These codes are used in analyzing expert viewers' critiques, novice viewers' interview and questionnaire transcriptions, and artist' interview transcription.

A Book from the Sky

The *Book* is a text in this study. Chinese characters are the symbols of Chinese culture. When the cultural symbols are deconstructed and reconstructed into familiar but new symbols, how do viewers of different ethnicity, age, gender, and profession create meaning when they are interacting with these new symbols (in this case the text)? In the following discussion, codes or syntax of the *Book* are analyzed because a close textual analysis is of primary importance to a further analysis of text, reader and artist. The textual analysis consists of the following elements: codes of Chinese language, codes of Chinese characters, codes of classic Chinese books, and codes of installation of the *Book*.

Introduction to Chinese Language. The Chinese language has a history of more than six thousand years (Zhen, 1983, p. 3). It is the oldest language still being used in the world today. Unlike other languages, Chinese language grows on itself without the influence from others. Chinese language uses images as the basis of a character to combine with sound and meaning. This combination forms an intricate and diversified language system. Since China has the highest population in the world and Chinese is the official language of the country, Chinese language is used by the greatest number of people. In addition, Japan is still using Chinese characters; Vietnam and Korea which formerly used Chinese characters, have kept some of the Chinese characters in their languages, making the population of Chinese language users even bigger. Because Chinese language is not a phonetic based language, it causes more difficulty in its use than do most of the languages in the world. Chinese characters consist of three parts: image, sound, and meaning.

Codes of Images. Chinese characters are constructed on the basis of the imitative symbols or the characters that carry imitative components. As an origin, a Chinese character is created based on an image of a real object. The system of Chinese characters is basically an ideographic one. "Because of the retention of the ideographic script, in China no conceptual separation occurred dividing writing from painting and the other arts. Calligraphy, in fact, had been 'the mother of Chinese pictorial art and always its ally'" (Miller, 1983, p. 44). As a result, Chinese language becomes the only language in the world that is an artistic language. Chinese characters remain in square shapes. The arrangements of components of each character are constructed in a square from top to bottom, from left to right, and from outside to inside.

The *Book* strictly follows this pattern of structures to create thousands of new characters. These retained structures in the newly invented characters attracts a Chinese reader to believe that they are real characters.

Codes of Sound. Chinese language is not a phonetic based language nor a language based on images alone. The special feature is its combination of sound and image. This feature began even during the time of inscriptions on bones. More and more characters bearing this feature were added to the vocabulary. By the Qing Dynasty (1644-1911), in the Kang Xi dictionary, there were about 49,030 characters which had the combination of phonetic and image occupying ninety-two percent of the total vocabulary (Zheng, 1983, p. 4). Since so many characters have phonetic components, the phonetics give clues to the sound of characters and the image provides the clues to the meanings.

The *Book* retains all the phonetic parts of Chinese characters, but newly invented characters do not carry the original meanings of the phonetic components. Thus, in appearance, they seem pronounceable but actually they are not.

Codes of Radicals. A Chinese character is put together by a number of strokes. Several strokes, when combined become character components or radicals, which themselves have specifically defined meanings. Radicals are the essence of Chinese language. They are originally individual, independent words. When a radical becomes a part of a new character, it carries its own meaning over to the new one, which is influenced by the meaning of the radical.

Codes of Grammar. Grammar is the system of structure in a language. Chinese grammar contains three basic units. They are words, phrases, and sentences. English grammar is characterized by the changes in verbs to indicate tense; and -s or -es or -ies to show plural. In English, nouns, pronouns, adjectives, and adverbs have their distinctive features. For example, nouns have suffixes, such as -tion, -ness, -ism and so on; adjectives have suffixes such as -tive, -ful, -less and so on; and adverbs have suffixes such as -ly. However, in Chinese there are no such grammatical functions to differentiate the features of speech. The form of plural is reflected in measure words. The feature of possessive concepts, changes of tenses, and conditions of mood are characterized by the uses of auxiliary words which is "an unstressed form word that performs the grammatical functions of structure, tense, or mood (Department of English Language, Beijing Foreign Languages Institute, 1985, p. 917). Therefore, it is impossible to tell which word is a noun, an adjective, or a possessive noun in Chinese language without knowing the meanings of characters in a sentence. In other words, it is possible to create a fake English sentence with correct grammatical structure without retaining the meaning of individual words. For example, "This is a futication that was grotectically precuted." This made-up sentence invites reader to believe this is in English language simply because the English grammatical structure was retained. Though it is not possible to do this in Chinese, Chinese radicals, square-shaped, well constructed characters in real paragraphical arrangements, sentences arranged in book page formats provide the syntax patterns or codes of Chinese language. To arrange all the fake characters in book form, as was done in the *Book*, invites Chinese-speaking readers to read them. Therefore, the fashion by which the *Book* was presented adds another element for the analysis of the *Book* (Figure 1).

Traditional Chinese books are protectively covered in wood boards or in wood cases. The title is pasted on the

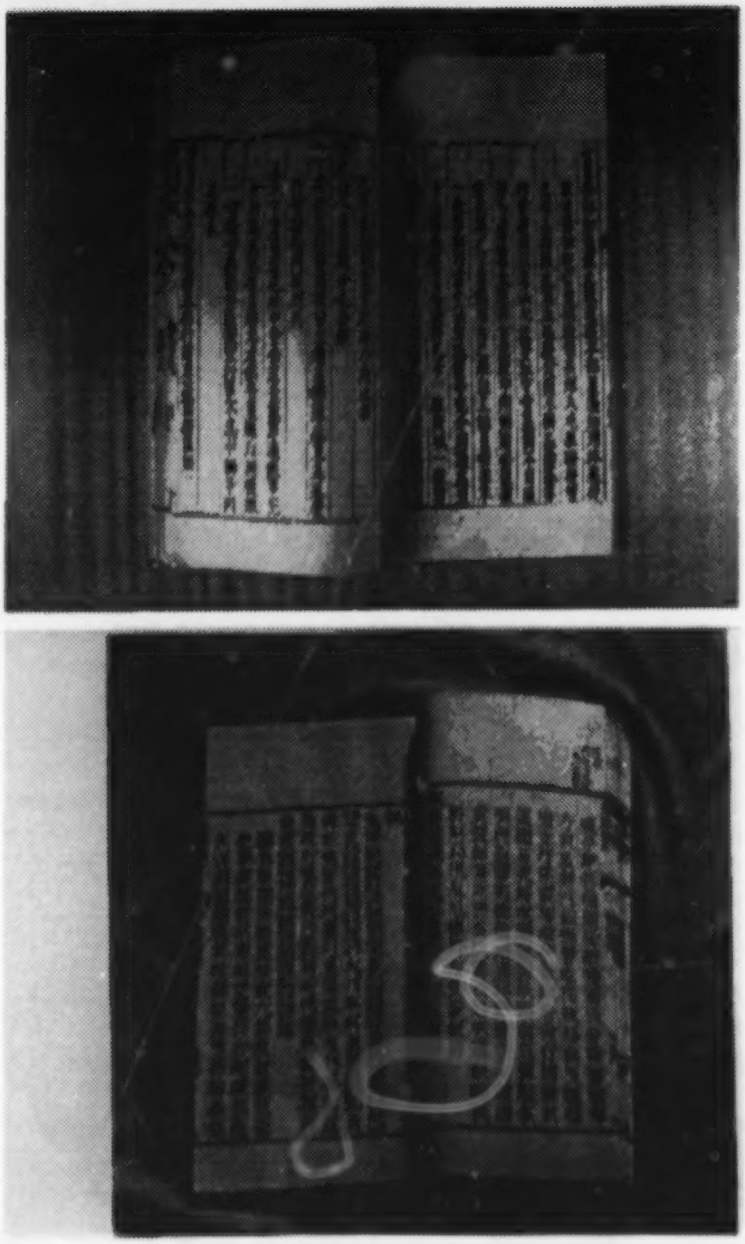

Figure 1

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cover board. The whole *Book* was kept in a protective wood case (Figure 2 shows the comparison of an actual classic Chinese book covered in wood boards and the *Book* covered in its wood case). The binding of this *Book* is traditional Chinese stitched-binding style. Stitched-binding represents centuries of evolution in Chinese book-binding.

Codes of Installation of the Book. The installation of the exhibition was not a traditional one in terms of the usual exhibitions of Chinese prints. The whole installation consisted of three parts: three long, scroll-like strips were suspended or draped from the ceiling in a sweeping arc (Figure 3 shows the comparison of a Chinese scroll and the piece exhibited in the Museum); printed sheets of fake characters covered the walls from floor to ceiling; and hundreds of stitch-bound books in traditional Chinese classic format were laid open in rows on the floor with a number of wooden cases on either end of the rows. The main exhibition walls were black. To bind a book in a roll dates back to the earliest history of Chinese book-binding. Martinique (1983) indicated, "the first example of Chinese written literature to be found was the rolled or folded slips of bamboo and wood" (p. 65). Therefore, to a Chinese, a book in a roll signifies the traditional Chinese classics. To an American, it may seem to be a precious ancient document. The installation was open to the viewers' reactions.

In summary, the codes of Chinese language: images, sound, and meaning; phonetic components; radicals; structures of Chinese characters; Chinese grammar; form of the *Book*; and finally, installation of the *Book* are actually syntax patterns which may be called codes. A syntax pattern gets created by the conventions of production which are repeated daily. The syntax patterns or codes are culturally constructed. They need to be examined for paradigmatic meanings, which

> supplied by syntax patterns or codes and readers can only work with codes with which they are familiar and they are only familiar with codes that come from the worlds or paradigms to which they have access or which they have experienced, in other words, their culture (DeVaney, 1991).

Expert Viewers' Critiques

Various critiques by Chinese critics are used for analysis. The codes in the *Book* are used to analyze the critiques of expert viewers in order to compare the similarities and differences with the interpretations of the *Book* of the United States viewers. The analysis also includes an examination of the expert viewers' readings of the *Book* at different historical moments. In addition, the analysis compares the similarities and differences between the artist's intentions and the expert viewers' reception of the *Book*.

Novice Viewers' Interview and Questionnaire Transcriptions

The data collected from United States viewers' interviews and survey are transcribed. The poststructural textual analysis consists of an examination of United States viewers' responses to the codes in the *Book*; comparisons of similar and different interpretations of the codes by United States viewers of different subject positions (i.e., age, gender, profession); and a comparison of United States viewers' responses toward the *Book* and those of Chinese critics.

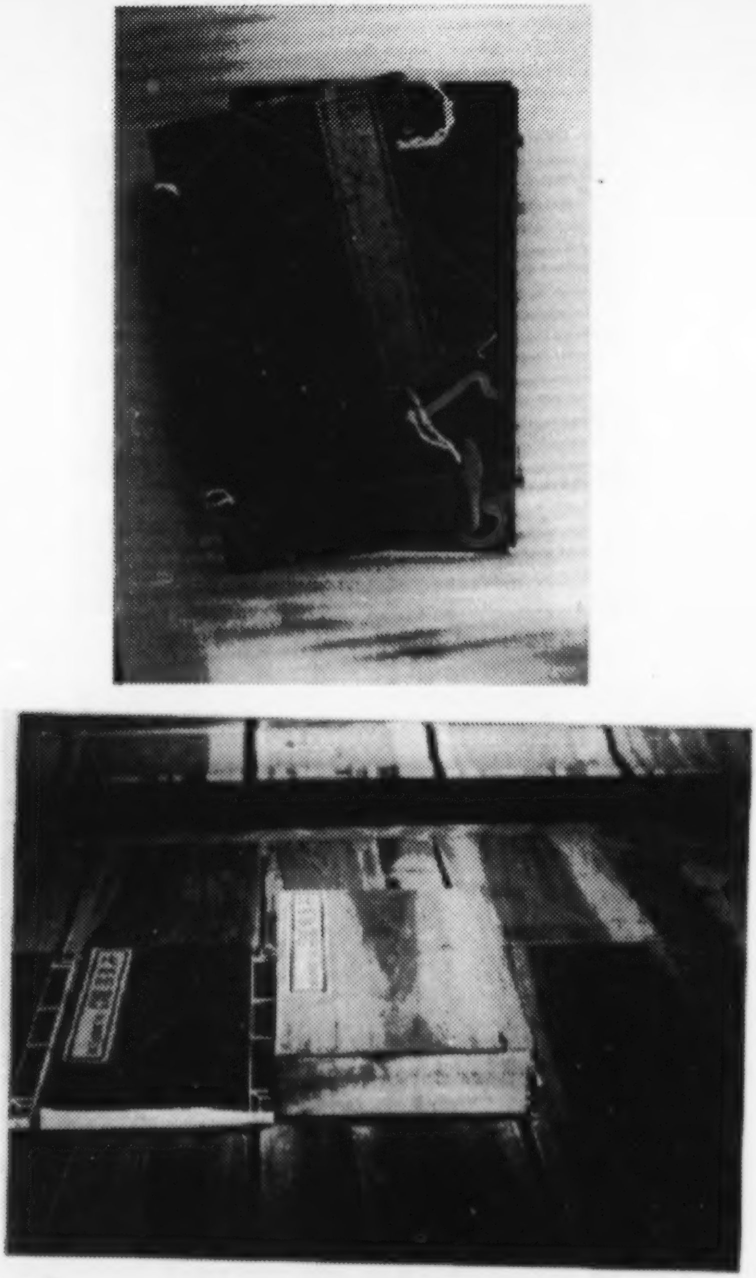

Figure 2

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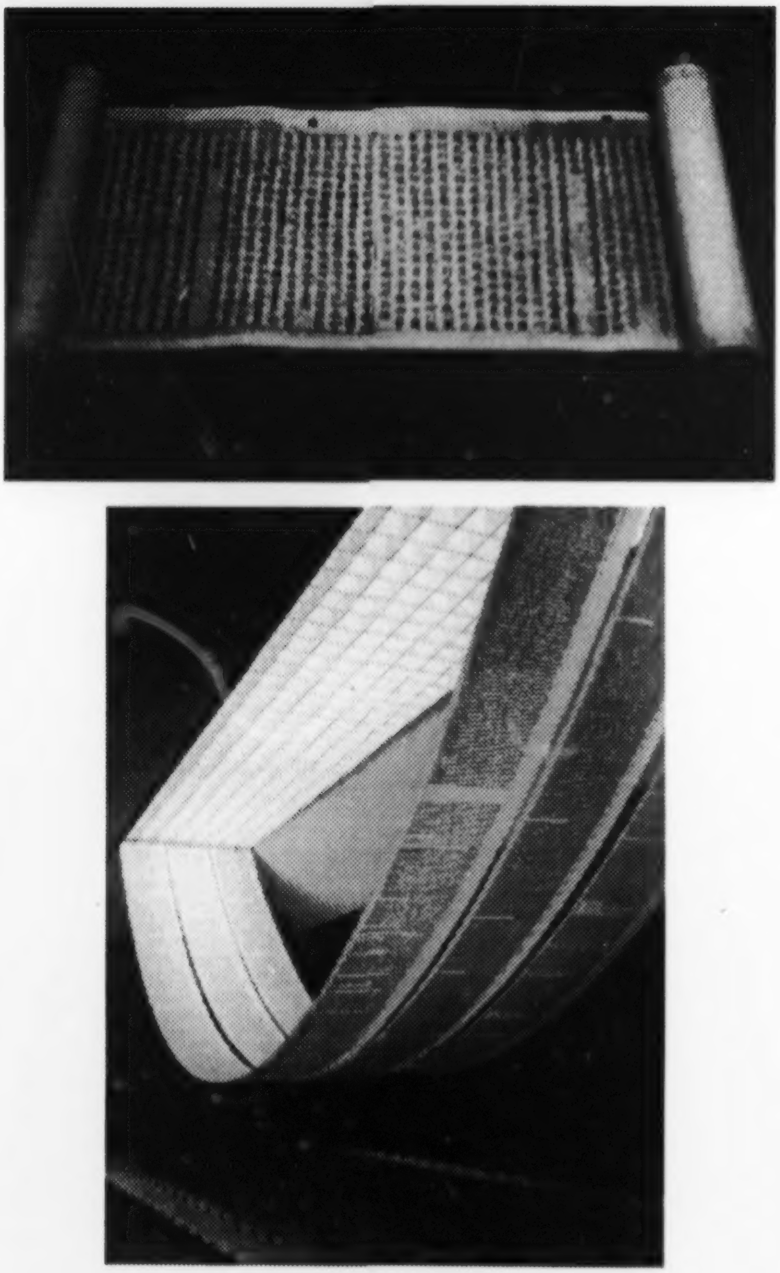

Figure 3

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Interview Transcriptions of the Artist

A telephone interview and a videotaped interview with the artist were conducted. Transcriptions of the interviews are analyzed to compare the similarities and differences between the Chinese critics' interpretations and the artist's intentions. The same comparison is also made between the United States viewers and the artist.

Theoretical Foundation

Research on educational television and computer programs, applying reception theory, has been carried out recently. One example is an analysis of *Where in the World is Carmen Sandiego*. Reception theory was used to examine the process of creating meaning while using an educational computer program (DeVaney, 1993, p. 182). By applying reception theory, researchers examined such issues as gender, ethnicity, and race. Art work is also a media text that can initiate interaction between and among the viewer, artist, and the art work itself; however, no research using reception theory has been done on art work. Therefore, DeVaney's model is adapted to carry out this research.

DeVaney's model is based on reception theory as shown in the works of Hans Robert Jauss, Roman Ingarden, Stanley Fish, and Wolfgang Iser (their works on reception theory, 1970, 1973, 1985, 1978, respectively). DeVaney emphasizes that a reader/viewer creates meaning when interacting with a media text that is coded and in which the author's intent is embedded (DeVaney, 1993). *Reading*, *text*, and *community of viewers*, the key concepts of reception theory, are defined in DeVaney's model. DeVaney also stresses that codes are socially and culturally constructed, shared, and communicated by the members of certain communities. Her model and these concepts serve as the theoretical and methodological foundations to investigate the interactions between and among viewer, artist, and art work.

Reader-response theory has its origin in the theories of literary criticism. Structuralist theorists believe that the meaning of a literary work resides only in the text (i.e., the text has coded messages given by the author). Though early writers Walker Gibson, Georges Poulet, Gerald Prince, and Michael Riffaterre, attempted to address the importance of the reader in the reading process, their views were still text-oriented (i.e. meaning is located in the text itself). Unlike the above structuralist theorists, "all reader-response critics focus on readers during the process of reading" (Mailloux, 1982, p. 20). Reader-response theory "replaces examinations of a text in-and-of-itself with discussions of the reading process, the 'interaction' of reader and text" (Mailloux, 1982, p. 2). It examines "the role actual readers play in the determination of literary meaning, the relation of reading conventions to textual interpretation, and the status of the reader itself" (Tompkins, 1980, p. ix).

Historically, Hans Robert Jauss represents the German phenomenological reception theory, which stresses the inseparable aspect of the reader and the text from a historical perspective. Though Jauss saw the relationships between author, text, and reader, he stated them in a historical connotation. A reader's position is related to the text from a present and historical point of view as well.

Different from Jauss, Wolfgang Iser's phenomenological reader theory focused on the reader's active participation in the production of textual meaning (Tompkins, 1980, p. xv). Iser (1978) pointed out that "reading is not a direct 'internalization,'" but a dynamic interaction between reader and text. Though Iser emphasizes the reader's participation in the reading process, he does not mention the social relations the individual reader possesses that influence the meaning creation process. To him, the reader is able to experience the meaning creating process provided by the text. To him, text and reader are still interdependent.

American reader-response theorist Stanley Fish departed from the phenomenological model of reader theory to a social model that has its belief in the social construction of knowledge. In his model "the reader was freed from the tyranny of the text and given the central role in the production of meaning" (Fish, 1980, p. 7). He also created the concept of "interpretive communities" in which the members share the assumed goals and purposes within the same community. Members in the same community would agree based on their common interests. By using his concept, an investigation can be conducted on how meanings are constructed while interacting with the *Book* by viewers of different age, gender, ethnicity, and profession. In other words, it answers such a question as "How does this community (group) of viewers react to the *Book* instead of "How does an individual viewer react to the *Book*?". In order to investigate the relationships between and among artist, viewer, and *Book* in the present study, Fish's American adaptation of reader-response theory has more power than the ones discussed earlier to carry out such an analysis. It allows an investigation of meaning making by viewers from different communities. All these theories, however, lack explanation of the individual reader's subjectivity, which influences the interpretations of the text.

One's subjectivity is created based on his/her social interactions or relations through society and language. Subjectivity is constructed on different social dimensions based on one's gender, age group, family, class, nationality, and ethnicity (Fiske, 1987). Thus, Fiske says that "subjectivity is the product of social relations, whereas individuality is seen as the product of nature, or biology" (Fiske, 1987, p. 49). Art works may or may not show subject positions directly, but the cultural codes embedded in the works are still envisioned by the viewers according to their different social and ideological identities such as gender, age, ethnicity, and profession. In short, "meanings are determined socially: that is, they are constructed out of the conjuncture of the text with the socially situated reader" (Fiske, 1987, p. 80).

Analysis

Since the objective of the study is to apply reception theory to compare and contrast and between and among the meanings constructed by viewers of groups differing in age, gender, ethnicity, and profession, the analysis begins with reader response analysis of the *Book*, which focuses on how readers interpret the *Book* according to the embedded codes and their subjectivity such as age, gender, profession, and ethnicity. As John Fiske pointed out that one's subjectivity is socially constructed. Seven types of subjectivity are identified: self, gender, age-group, family, class, nation, and ethnicity (Fiske, 1987, p. 50). For the purpose of this study, subjectivity of age, gender, and ethnicity are selected, which are believed to have influence on viewers' interpretations of the *Book*. In addition, these three types of subjectivity are manageable in carrying out this research in terms of identifying them with the proposed research methodology. Because one's subjectivity is constructed based on his/her social relations, for this study, profession is also selected as one type of subjectivity. Profession, therefore, is defined as the identity of a viewer when he/she is being interviewed, for example, a student, a teacher, or a retired engineer. Viewers' social positions as reflected in their professions are believed to show their relationship with viewers' responses.

Codes described earlier provide access to the analysis of readers' responses. The interview questions are designed to obtain the viewers' reaction to the codes and their feelings about the art work. They are:

1. What feeling do you get when you look at this?
2. Do you like it?
3. What do you like about it? or What do you dislike about it?
4. What do you think this is?
(the whole piece, the roll, the banner, and the language)
5. What does this (or those) remind you of?
6. What is your profession?

Observation, appreciation, impression, and interaction with an art work is often a matter of feelings. Feelings are an inseparable part of interpretation. Interpreting an art work is different from doing a scientific experiment in which feelings are separated from observations (Feldman, 1991, p. 412). When interpreting an art work, one is not looking for the causal relationship between the observations and the feelings, one is "looking for an idea that will connect his feelings to each other, and also connect them with the observations he has been making about the object" (Feldman, 1991, p. 412). Therefore, viewers' feelings, impressions, sensitivity, intuition, intelligence, and responses are important elements of interpretations.

Viewers expressed their emotional responses to the *Book* during the interviews and mail questionnaires. They used many different adjectives to describe their feelings. All the viewers indicated that they liked the *Book*. Five types of emotional reactions to this *Book* and its installation were predominant: viewers were awed and impressed by the efforts and massive amount of work the artist had done; they admired the beauty of the visual effect of the work; they agreed with the artist's concept of the futility of human efforts; they had feelings of being in a religious place; and weird feelings about what the artist accomplished. Because of the limited space for this paper, the details of the analysis of viewers' emotional responses will not be covered here. For further reading, read *A Reader-Response Analysis of "A Book from the Sky--A Postmodern Educational Enterprise* (Ma, 1993).

Conclusions

Conclusions are drawn from the analysis and highlight reception theory (which is the theoretical foundation for the study); viewers' subjectivity and their responses; and intertexuality. It also discusses how this study contributes to the areas of reception theory, education, postmodern art, and Chinese art.

Historical Reading

From a historical perspective, according to reception theorist Hans Jauss, each reading at different moments of time produces different meaning. He believed that "the historical life of a literary work is unthinkable without the active participation of the addressees" (p. 19). The analysis showed two readings of the *Book* by Chinese critics at different historical periods resulting in different interpretations. The first reading happened before 4 June 1989 when the atmosphere for creativity in art and literature was open and liberal and when the influence of Western cultures was strong. Artists interested in postmodern concepts created their works in styles similar to those seen in the Western countries. When the *Book* was exhibited in late 1988 and early 1989 in China, positive reviews and critiques appeared in magazines and newspapers. The *Book* was once considered as "one of the most representative works since the New Wave of Fine Arts in 1985" (Lin, 1990). After the Tiananmen Square incident on 4 June 1989 when the student movement was crushed, the Chinese government's control of arts was restored to preserve socialist principles for fine arts. Articles of negative criticism appeared in different journals and newspapers. The criticism targets on the purpose of the art work that failed to serve the Chinese reality but followed the Western philosophy and artistic outlook.

Reader's Construction of Meaning

American reception theorist Stanley Fish believed in the social construction of knowledge. In his version of reception theory, "the reader was freed from the tyranny of the text and given the central role in the production of meaning" (Fish, 1980, p. 7). When talking about Fish, Jane Tompkins (1980) pointed out that "meaning is not something one extracts from a poem, like a nut from a shell, but an experience one has in the course of reading" (p. xvi). Reading is then defined in this study as the process of creating meaning when viewing *A Book from the Sky*. The *Book* is a communication that has been encoded by socially constructed signs and symbols that remain dormant until they are received by the viewer. It is the viewer who creates the meaning (DeVaney, 1990, p. 5). Stanley Fish also created the concepts of interpretive strategies, which are shaped by the readings of interpretive communities. Members' interpretations often agree because of their membership in the same community. But a reader's "subjectivity is the product of social relations" (Fiske, 1987, p. 49).

Meanings constructed by different age groups

The analysis showed that viewers of very young or old ages did not comment much on the codes. Viewers between the ages of thirty-one and forty-five not only made up the largest age group in number of interviewees, but also their interpretations were the most diverse. They related the *Book* to Chinese culture, Chinese language, and ancient culture. They also compared the draped piece on display to banners and newspapers; the piece pasted on the walls to the Vietnam War Memorial, microchip data, information; the books on the floor to waves, ripples, water; the exhibition environment to libraries, theater, and universe; the type of art to Dada, Duchamp, conceptual art, history, communication, interpretation, and Zen spirit.

Age does seem to affect the construction of meaning. One extreme is that a viewer of very young or old age is unable to relate much of his/her social position to the text. It is also clear that meanings made by viewers aged between thirty-one to forty-five are more diverse. Their interpretations represent a spectrum of meanings at different intellectual, social, cultural, and other levels. One conclusion is that the closer one's age is with that of the members in an age group, the more likely one's interpretation of the *Book* is to agree with meanings made by the members in same age group. Except this conclusion, the other conclusions about age cannot be generalized but it is safe to say that age is an important element in construction of meaning.

Meanings constructed by different gender groups

Just as the conclusions about age cannot be generalized, neither can the conclusions about gender, but it is interesting to note the role of gender played in the reading of the *Book*. The analysis shows that more female viewers expressed their feelings of visual beauty of the *Book* and they showed more admiration for the wholeness of the piece and the efforts the artist put into it than did male viewers. More male viewers were interested in the concept of "futility of human endeavor." It is extremely important not to generalize these statements about gender. Essentializing positions are counterproductive. Suffice it to say that the male and female responses here are unique to this study.

In interpretations of the codes of Chinese scrolls in relation to the draped piece in the museum, more male viewers expressed their thoughts. They compared the draped piece to banners, newspapers, ocean waves, window-dressing, something coming to the earth and from the sky. Fewer female viewers commented on the comparison. When both gender groups interpreted the codes of Chinese paintings, which are the sheets pasted on the walls, interpretations of male viewers differed greatly from those of female viewers. Male viewers interpreted the sheets pasted on the wall as reminders of the Vietnam War Memorial, ROM code for a computer, and libraries. Female viewers interpreted the sheets pasted on the walls as wall papers, patterns, statements on bathroom walls, and catalogs and information. These findings show that these viewers constructed meaning based on things they deal with daily, their observations, and experiences in their lives.

Meanings constructed by viewers of different professions

The analysis shows profession, one of the social relations in one's life, influences one's construction of meaning when viewing the *Book*. Artists related their interpretations to their world of learning, knowledge, history, philosophy, and practice. The *Book* was considered as conceptual art, Dada movement art, Zen philosophy, theater, movies, and so on. A teacher related his interpretation of the exhibition to libraries, which he thought was important in a learning environment. A scientist associated the process of making this *Book* to his science training process. A technician connected her interpretations to catalogs and information. And a house wife interpreted the sheets of faked characters on the walls as wall paper. These interpretations demonstrate the influence of viewers' social relations on their meaning making processes. Their social relations play a role in their construction of meanings. They do not rely on the text to extract meaning out of itself, but create meaning related to their profession. Viewers of the same profession often tend to agree on their interpretations.

Text

In this study, text has two meanings. The first is the physical mass of the fake characters and the *Book* itself. Though the characters do not bear any meaning or sound, the *Book* is a communication carrying socially and culturally encoded messages, which may be understood and interpreted by viewers in various ways. The findings of the study show that viewers interpreted the text based on their subjective positions. The other meaning of the "text" is the constructed meanings by viewers of the same subjective positions. Viewers are drawing upon the discourses in which they are positioned to interpret the physical text. Discourses themselves, may be called texts "writ large."

Intertexuality

Intertexuality "suggests that certain meanings of one text are created only by the existence of related texts" (DeVaney, 1987, p. 6). It "calls attention to prior texts in the sense that it acknowledges that no text can have meaning without those prior texts, it is space where 'meanings' intersect" (Marshall, 1992, p. 128). The *Book* intertexualizes Chinese classic books, Chinese characters, Chinese language, traditional Chinese book-binding, Chinese prints, and other aspects of Chinese culture. How the viewers read the text depends on their knowledge of these other texts. The viewers exist "within the textuality" (Marshall, 1992, p. 136). The reader becomes a co-producer, a co-collaborator of a text or interpretation. The reader takes on shared responsibility for the text's "meaning" (Marshall, 1992, p. 135).

Drawing from different discourses, the readings of Chinese critics and United States viewers show great variation in their construction of meaning.

Meanings constructed by Chinese critics

When the Chinese critics read the *Book*, they located their meanings in Chinese culture, Chinese art, Chinese language, characters, Chinese prints, scrolls, calligraphy, the origin and relationship of Chinese painting and characters, arrangement of terra-cotta soldiers, Chinese language reform, typography, invention of printing, book-binding, Chinese society, and other aspects of Chinese culture and society. For example, critic Yin Ji-nan (1988) dated the printing process of the *Book* back to "the time when Bi Sheng invented typography around 1045, but the technique is now developed into a kind of unreadable modern print." Critic Wang Lin (1989) said, "these fake characters are arranged like terra-cotta soldiers of the Chin Dynasty." Critic Fang Zhou (1990) related the *Book* to the Chinese painting and traditional books. "From the point of view of a 'book,' it has the beauty of traditional thread binding and structure of characters; from the point of view of 'painting,' it also has the beauty of visual combination of abstract dots and lines." The critics agreed on the interpretations of the *Book* as Chinese book, characters, Chinese traditional binding, and other features of Chinese characters and language.

Meanings constructed by United States viewers

The United States viewers read the *Book* to locate meanings in their culture as well. The codes in it invited them to read that with which they are familiar. They related the draped pieces in the exhibition hall as banners hanging or newspapers. They interpreted the sheets with fake characters pasted on the walls as reminders of the Vietnam War Memorial, wall paper, and statements made in public areas. They considered the *Book* as ancient culture.

The analysis shows that the *Book* intertexualizes many things both in Chinese culture and other cultures. It is the reader who takes the responsibility to locate prior texts to create meaning and write the text when interacting with it.

Artist

The analysis of the study shows that the shared cultural, social, political, and other positions of the artist and the viewers are the important factors that contribute to the interpretation of the intentions of the artist. Chinese critics not only agreed that the *Book* is intended to warn people that it is culture that restricts them, which is the intention of the artist, but also they understood the intended purpose of the special method of installation, which is to make the exhibition hall look like a dark prison of words or a sorrowful place. These well arranged, designed, and invented characters do attract Chinese-speaking viewers to believe that they are authentic characters. Because of the process of deconstruction and reconstruction of the characters, Chinese critics studied the origin and relationship between Chinese paintings and characters and the impact of these authentic-looking but non-real characters on the practice of Chinese calligraphy.

The intentions of the artist were not well shared by United States viewers. It is impossible for them to have the real first-hand feel of the social, cultural, and political conditions in China when the *Book* was made. Because of the lack of the knowledge of these conditions, they interpreted the installation as a learning environment, a peaceful place, church, and universe, which are available in their culture, but not the intention of the artist. Though their interpretations did not match the intentions of the artist as they interpreted the codes in the *Book*, they created meanings of these codes out of the context in their own culture. For example, they compared the Chinese scroll as banners and newspapers and Chinese paintings hanging on the walls to Vietnam War Memorial and wall paper. These differences resulted from the differences in culture and society and other aspects.

Implications of the Study

This study provides us with a method to apply poststructural reader-response theory in the analysis of postmodern art as visual texts. Since postmodern art work is a visual text carrying embedded cultural codes which invite readers (viewers) to read them, the reading activity of the viewer is a process of producing the meaning of the visual text. The viewer is to finish the work meaning that a text is not complete until interacted with the viewer who "writes the text," (i.e., produces meaning of the text). Interpreting a visual text is not to be an individual critic's own interpretation, rather, it is important to recognize the interpretation by a community of viewers who share the same subject positions. The study also contributes to the theory of art criticism in recognizing that it is impossible to understand postmodern art simply by looking at formal qualities as modern art critics did, because postmodern art is a mirror of current social, political, and cultural awareness; it is in many genres; it is a hybrid of multicultures; there are no country boundaries. This study is particularly valuable during "a period of particular crisis in art criticism" (Wallis, 1984, p. xi).

In addition, this study gives us a better understanding of contemporary art in China. From the years of 1985 to 1989, Chinese art began to reflect social, political, cultural, and other values. It is different from art in those stages of Chinese history when content determined form and form served content. The purpose of art then was for the socialist cause.

Through a poststructural textual analysis of the *Book* and the subject positioning of the viewers, the study not only contributes to the understanding of the nature of language, meaning construction, and its relationship between socially positioned reader, but also to the understanding of subjectivity, which is socially produced. The study provides teachers and students with an opportunity to be in an open classroom to critically view this visual text from political, social, and cultural nuances. *A Book from the Sky*, therefore, possesses educational value. It not only educates the viewers about the social, political, and aesthetic qualities of the work itself and but also about the background and conditions of China.

Postmodern theory of art stresses that art is a cultural expression. "Art is a collective communication about the experience of life in a particular culture" (Grieder, 1985, p. 8). The embedded cultural codes in the *Book* indicate strong cultural expressions. A postmodern art education approach not only recognizes the learning of self-expression techniques but also regulating power of social forces (Parks, 1989, p. 13). Thus, education in postmodern era is not classroom-bound in a traditional sense. *A Book from the Sky* provides viewers with an opportunity to confront with cultural images, issues, and ambiguities. The *Book* can also be regarded as a medium that facilitated liberatory education from a point of view of critical pedagogy (Ellsworth, 1987, p. 33). Viewing and interacting with the *Book* to create meanings is an educational experience in a museum, which might be called an open classroom. This open classroom provided viewers or students with the opportunity to reflect on their subject positions and critically view this visual text with political, cultural, and artistic nuances. The experience of viewing the *Book* provided students with an opportunity to confront visual images from a different culture and to engage issues related to that culture, which were embedded in the images. In addition, this study offers an awareness of how global advances in communications and technology have changed Chinese art and created art without boundaries. In this respect, the *Book* serves as a postmodern educational vehicle to mix art with technology.

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The Syntax of Moving Images: Principles and Applications

Nikos Metallinos

Abstract

Empirical research on picture perception, comprehension, and composition in the field of visual communication media has not explored thoroughly, and it has not seriously considered the syntactic differences between still and moving images. The role of motion in the study of visual images has only occasionally been theorized, decisively down-played, and persistently overlooked. This paper (a) examines the various theories of motion relating to visual communication media, (b) discusses the syntactic rules of moving images that derive from those of still pictures, and (c) underlines the motions employed in the construction of moving images, primarily television pictures.

Introduction

The skillful control of motion and its effective application in structuring visual images is only an occasional practice by film and television program directors. The role of motion in the study of visual images has sporadically been theorized by visual communication media scholars (Arnheim, 1969; Gibson, 1968; Zettl, 1990) and empirical research that verifies the theories is minimal (Metallinos, 1985). The textbooks of film and television picture composition persistently downplay the importance of perceptual information provided by camera motion (Kipper, 1986); they decisively overlook the significance of object camera motion (Johansson, 1975); their commentary centers, mainly, on the role of motion in film and television editing techniques (Wurtzel, 1983; Zettl, 1993); and occasional articles on the differences and similarities between print (the written word) and electronic media (moving images) consider motion a factor, a construct, that generates a sense of reality (Kaha, 1993; Wober, 1988), bypassing the perceptual, cognitive, and compositional reasons for it.

A review of literary sources regarding the synthesis of moving images indicates that the main reasons that delayed the creation of a universally accepted syntax of moving images are as follows:

1. Most of the influential pioneer scholars of visual communication media claim that there are powerful similarities between still and moving images when we consider their perceptual messages. For example, in *Movement, Film, Communication* Saul Bass (1966) states:

> We tend to think of movement and time-span as the unique attributes of film. Yet these qualities are common to both painting and film. If we should examine, let us say, a Ruben's painting, we should see that it has a built-in time-motion factor. When a painting surface has objects placed upon it, a sequence in time

> must be assigned to these objects. We see them sequentially, albeit with infinitesimal time duration between each step. (p. 200)

2. The perception and comprehension of motion, let alone its skillful composition, are considered by most pioneer visual communication media scholars complex phenomena always interrelated to space and time. As such it was--and still is for many researchers--a compositional factor readily explained with the term adopted by still pictures, including paintings, photographs, and frescoes. Because for some visual media researchers film and television images are still pictures--which these media mechanically turn to moving pictures--they do not need to be examined separately. As Dondis (1973) states:

> But note, even in this form [motion picture] true movement does not exist as we know it; it lies not in the medium, but in the eyes of the beholder through the physiological phenomenon of "persistence of vision." Movie film is really a string of still pictures containing slight changes, which when reviewed by man in the proper time intervals, are blended together by a holdover factor in seeing so that the movement appears real. (p. 64)

3. The most important reason for the delay in the creation of the syntax of moving images is the lack of communication between academic researchers and the traditional barriers that separate the arts and humanities from the sciences. For example, whereas research findings in the fields of perceptual psychology, physics, neurophysiology, and experimental psychology have studied and have revealed the various motions (real, induced, apparent) as they relate to visual images, in the field of communication we are either not cognizant of these findings or we are unable to explain them in communication media related terms (Fletcher, 1985; Metallinos, 1977, 1983).

The information explosion and computer technology have now broken the barriers between disciplines. Consequently, the suggestions of the pioneer scholars of visual communication media to explore the potentials of motion in the kinetic arts media of film and television and to create a unified syntax of motion can now be implemented. We need to point out the differences between still and moving images; to underline their diverse perceptual, cognitive, and compositional properties; and to emphasize the advantages offered by the various forms of motion over the limitations of the still images. As Moholy-Nagy (1969) pointed out years ago:

> While in photography not the camera but the light sensitive emultion is the key to genuine work, in the motion picture not the emultion, but the possibility to produce motion is the key to the film production. And yet there is no theory for the use and control of motion. In the majority of films, motion is still so primitively handled that even its basic principles remain to be involved. Practical experience has been confined to a few decades and the eyes apparently are as yet untrained to receive sequences in simultaneous motion. In the majority of cases the multiplicity of movements, even if well controlled, still convey the impression of chaos rather than organic unity. (p. 278)

Advances in new visual communication media, such as three dimensional film and television, holography, high definition television, and computerized images, have occurred since Moholy-Nagy (1969) and other pioneers such as Kepes (1966), Arnheim (1969), and Gibson (1968) suggested a closer look at the perceptual, cognitive, and compositional properties and potentials of motion in the structure of moving images. Yet, a unified, confined, and universally accepted syntax of moving images is non existent.

This paper argues in favor of the creation of such syntax and provides the theoretical bases for its implementation. Specifically, this paper (a) reviews the various theories of motion that relate to visual communication media, (b) discusses the syntactic rules of moving images stemming from the compositional principles governing still images, and (c) underlines the major motions employed in constructing visual images, and primarily television images.

Theories of Motion and Moving Images

The scientific arguments regarding motion perception and its subsequent movement comprehension are centuries old, diversified, and still appear inconclusive (Marr, 1982). The study of the perception of motion, on one hand, has always been very complex mostly due to the various extreme and multifaceted forms by which motion occurs. For example, in addition to the extreme velocities of motion that are present but we do not perceive (i.e., bullets shot from a gun or the slow process of the growing of the plants), in the perception of motion such complex factors as change, time, direction, distance are involved (Murch, 1973). The study of the comprehension of movement, on the other hand, depends on the observer's own abilities, convictions, beliefs, and memories to transform diverse motion codes to cohesive cognitive movements (Spigel, 1968).

These scientific arguments regarding the study of visually perceived and mentally conceived movements have generated three main theories of motion known as *real movement*, *induced movement*, and *apparent movement* (Spigel, 1968), each of which subdivides into various forms (or types of real, induced, or apparent motions). To provide the literature regarding this topic I will review, first, these motion theories (and their subsequent forms) and then I will underline their interrelationships, to provide the bases and to establish the parameters upon which the syntax of moving images should be built.

The Real Movement Theory

The real movement theory states in effect that: The successions of changes of objects, subjects, or events in the environment are the cues that the observer receives and develops his/her conception of occurrences of motion in the environment. Known also as *absolute*, *threshold*, or *objective movement* theory, this theory, according to Gibson (1968), incorporates the motions caused by changes of an object in the environment, changes of the position of the observer, changes of objects or subjects while the observer moves, changes of the heads and/or the body of the observers.

Neurophysiologists who have studied the real movement theory suggest that greater visual acuity regarding the perception of motion is found in the periphery rather than the center of the retina, in the rods rather than the cones of the fovea (Bloomer, 1976; Gregory, 1966). The area of the brain in which the coded motion signals are processed and translated into movements is mainly the visual cortex, also known as the striate cortex (Bloom, Lazerson, & Hofstader, 1985). The degree of comprehension of real movement depends on the degree of homogeneity of the environment, the size of the moving objects and their brightness. After repeated experiments on these factors, Spigel (1968) concludes that: "...the more homogeneous the field the greater the rate of motion required for the emergence of perceived movement. Lower thresholds were also obtained with decrease size and brightness of the moving target" (p. 104).

It is, therefore, apparent how significant the real movement theory is for the construction of the syntax of moving images and its subsequent application to film or television programs.

Induced Movement Theory

The induced movement theory states,

in effect, that the perception and comprehension of moving objects occur when their hierarchy of interdependence, developed by Duncke (1929), and their relationships as figures and grounds, developed by Hebb (1949), are present during the succession of changes. As Spigel (1968) states:

> The idea that motion is a quality conferred upon as an object by an observer is clearly illustrated by the phenomenon of *induced movement*. With two objects or stimulus elements arranged such that one is the surrounded for the other, regardless of which is set in motion, it is the surrounded target that is inevitably perceived as the element that is moving. (p. 105)

Also known as "figure of reference" (Bloomer, 1976, p. 96), or "relativity of movement" (Gregory, 1966, pp. 111-114), this theory is fundamental to the study of visual images for the following reasons: (a) it provides the foundations on which all objects are perceived in the field, orderly and in accordance with their prominence; (b) it allows the observer to make clear distinctions between objects moving across a particular background and a stationary background that is used as frame of reference, and (c) it identifies and helps to explain *motion parallax*, an artifact of the visual field that occurs when the observer moves his/her head or body, changing the spatial relationship between the eyes and the environment. These motion syntactic constructs should guide the constructors of moving images, particularly the composition of television images that require constant motion and change.

Apparent Movement Theory

The apparent movement theory refers to a series of phenomenal displacements that lack physical or real movement; they are illusionary, rather than real; they give the impression of natural movements, when in actuality the displacement of objects in space and their continuity is not physiological; it is indirect, inferred, or apparent (Bloomer, 1976; Gregory, 1966; Murch, 1973; Spigel, 1968).

Visual perception paradoxes created by various apparent movements, have been the concern not only of the pioneer neurophysiologists and perceptual psychologists cited above but primarily the Gestalt psychologists and visual communication media scholars. Due to the arrival of motion pictures (cinema first, and later on television and computer images), scientists of the apparent movement theory have identified and studied more closely the various types or forms of apparent movements known as the *phi phenomenon*, the *persistence of vision*, the *autokinetic effect*, and the *movement aftereffect*. I will discuss each of these forms of the apparent movement theory in reference to their contribution to the study of the visual communication media of film and television.

The Phi Phenomenon Movement

This movement has assumed its name from the pioneer gestalt psychologists who considered a number of illusionary, somewhat paradoxical, and unreal motion instances and studied them separately as basic types of apparent movements namely alpha (α), beta (β), gamma (γ), and delta (δ).

The *alpha movement* occurs when a successive presentation of a rotated figure, a trapezoidal window with distinctive lines, appears to expand or contract with the successive presentation of each position of the figure. The bases for the illusion of motion generated by alpha movement relies on the fact that the observer is conditioned to assume that a line is of a constant length and that the illusion is a result of a depth change in which the line moves closer and then retreats. Our firm beliefs and habitual convictions insist that what we see fits our previous experience. When, in reality, what we think we see is not what it is. These factors are also important. The successful interpretation of visual images depends on the accuracy by which they are constructed in the visual fields of the film and television screens so that they will not be misinterpreted and misunderstood.

Beta movement occurs when two spatially separated stationary targets are presented in succession during which the delay intervals and the distance between the targets have been proportionally analyzed to create the illusion--the apparent motion--of a single target moving from the position of the first target to the position of the second (Murch, 1976). For example, if the two targets were two flashing lights, rather than perceiving two lights flashing off and on we see a single light moving back and forth in a lateral direction. The successful beta movement effect can only occur when there is a perfect correlation and an optimal relationship between the factors *temporal intervals*, *spatial distance*, and *target illumination*. We can achieve the beta movement effect and we can use it successfully in structuring moving images as long as we are aware of their perceptual factors, their relationships with other visual elements, and their interactions.

The *gamma movement* occurs when the illumination level of a target increases or decreases, creating the sense that the size and the depth of the target are increasing or decreasing, thus creating an apparent change or movement. For example, when two separate but equal in size targets are either independently illuminated in equal temporal intervals, the illuminated target seems to move forward, decreasing the distance from the observer, and vice versa (Murch, 1978). The gamma movement depends on two main factors, the spatial arrangements and temporal intervals of the targets, and their subsequent illumination that maximize the changes of their size and their depth and create the apparent motion. These parameters are compositional tools in the hands of constructors of moving images and constitute the syntactic rules in the grammar of motion picture composition.

A strange phenomenon known as *delta movement* occurs when the stimulus conditions of the beta and gamma movements are combined. Both the temporal change of flashing lights (beta movement) and the illumination reduction or increase of the target (gamma movement), when they occur simultaneously create a change or the illusion of a motion in depth, which is defined by Murch (1976) as ". . . a lateral movement of the target from position 1 to position 2, as well as a movement in the third dimension" p. 281. Because delta movement, when applied to objects in the environment provides a sense of depth, it becomes an important syntactic construct of moving images, and is very practical in its adaptation in the construction of moving images.

In his collective examination of these four types of apparent movements, Gregory (1966) emphasizes first the importance of the phi phenomenon for the creation and the believability of cinema and television. He comments on the degree of tolerance of our perceptual apparati to provide spatial and temporal connections for the organic operation of these media. He concludes that: "The phi phenomenon does tell us something about the image-retina system: namely, that it is reasonably tolerant in its demands—which makes the cinema and television economically possible" (p. 111).

Closely related to the four types of illusionary motions of the phi phenomenon is yet another type of apparent or illusionary motion that we will call the *cinematic motion*. It is created by a phenomenon known as *persistence of vision*, which, simply stated, is the inability of the retina to follow the signal stimulation in rapid fluctuations. The process of image stimulation continues beyond the initial stimulation for a fraction of a second, merging separate images with one another, thus creating the illusion of a continuous and organic succession of moving images.

Both media, film and television, rely on the paradoxes of these two distinct visual facts, the phi phenomenon with its various types of movements and the persistence of vision, which is also known as retina lag (Bloomer, 1976). Both media depend on the physical law known as critical fusion frequency that determines at what point (what speed) the fusion of static pictures into a continuous flow of images occurs. The higher the flashing of lights frequency, the better is the fusion and, therefore, the less the flickering picture effect. The established rates of the twenty-four pictures per second projection for the cinema and the thirty frames per second for the television frame, although they are both below the critical fusion point, have been the standard projection rates with the support of special shutters (in the case of cinema) or faster moving interlaced rasters (in the case of television picture frame generation).

Although film pictures are generated differently than television, both images are subjects to *cinematic motion* theory. That is their rapid projections (above the initial fusion frequency point create the persistence of vision, which results in the illusionary cinematic motion. In other words there do not seem to be great differences in perceiving and decoding the cinematic motion of the media of film and television as we were led to believe when television first appeared. There do not seem to be grave differences in the aesthetic quality of the images produced by the two media since High Definition Television pictures are equal to those of film (Metallinos, 1991). These factors are crucial for the creation of the syntax of moving images and its subsequent application to film and television programs (Mathias & Pattersson, 1985).

A second major category of the apparent movement theory is the so called *autokinetic effect* (Greek: meaning self-moving, or moving independently), which occurs when a light, or a bright object, is placed on a homogeneous (mainly black) background and appears to move in all directions and at varying speeds as the observer moves. The illusion of motion is created because the dark background does not provide a clear textured reference for the figure (the light or the bright object). Consequently, the inability of our visual organs to distinguish adequately between the movement or drifting of the eye and the drifting of an object in space are the main reasons for the autokinetic effect (Rock, 1966). The structure of the environment, the background on which objects and events occur, plays a significant role in the perception of figures. Equally significant are the factors time and the size and intensity of the light as well as the stored memory of the observer.

Concerning time and place factors involved in the development of autokinetic movement and the factors of size and brightness of the objects, Spigel (1966) suggests that:

> The phenomenon [autokinetic effect] involves movement perception in the absense of displacement of the stimulus in either time, or space. A fixed luminous source in an unarticulated surround—one which reduces to a minimum any frames of reference or stability – is seen as moving in an erratic, unpredictable fashion. . . .Generally, the larger the light the weaker the auto-kinetic effect obtained. (p. 100)

As far as the role played by memory in decoding and explaining the autokinetic and audiokinetic movements, Murch (1976) suggests that:

> The influence of such extrinsic and intrinsic instructions on autokinetic and audioautokinetic effects suggests that the control processes and long term storage are integrally involved. Faced with an ambiguous stimulus situation the subject produces a perceptual response from his own repertoire of responses. (p. 73)

This is true, of course, with the perceptual processes of all phenomena, i.e., light, color, and sound. It is for this reason that the construction of easily distinguishable environments, the clear indication of time and location, and the precise identification of size, direction, and shape of objects in the environment are such important motion syntactic factors. We must consider them thoroughly and we must skillfully apply them in structuring moving images of film and television media to obtain clarity in our moving images.

The last category of the apparent movement theory is the *aftereffect movement* also known as the "water-fall effect" (Bloomer, 1976, pp. 100-101; Gregory, 1966, pp. 104-119; Spigel, 1966, pp. 111-113). This effect occurs in several instances such as (a) when we look steadily and intensely at the center of a moving phonograph record and then we suddenly look away or close our eyes, (b) when we persistently look at the center of a black spiral on a white background and look away or close our eyes, or (c) when we watch for a while flowing water, such as a river, and then we turn and look at a fixed subject. In all of these cases, apparent motion is an after movement in the opposite direction, which seems to be both paradoxical and inexplicable.

Although the aftereffect movement has been known since the ancient Greek civilization, neither physicists, neurophysiologists, nor perceptual psychologists have yet found the exact physiological reasons that cause the aftereffect movement. They have only speculated about it. For example, Gregory (1966), in explaining the aftereffect movement paradoxes, suggests that it must be attributed to the image/retina rather than the eye/head movement system. He proposes that two systems are involved—velocity and positional subserve movement perception. Bloomer (1976), summarizing the scientific speculations, concludes that:

> Just why the waterfall effect occurs is not clear. Some theories suggest that it results from overload firing of the specialized cell circuits in the brain that responds to motion. Other researchers feel that adaptation processes in the retina are at least partly responsible. In any case a stationary reference within the visual field appears essential for the waterfall effect to occur. This illusion, fortunately, does not happen when the moving field covers the entire retina. If it did, we would suffer the waterfall illusion of every sudden automobile stop. (p. 101)

The factors, therefore, which determine the aftereffect movement such as motion velocity, object position, the cooperative effort of peripheral and central vision, the objective and apparent movement, and the image/retina movement rather than the eye/head, are the constructs that comprise the parameters of the syntax of moving images.

An interesting and lengthy dispute has occurred, over the years, among visual perception researchers regarding the differences between real and apparent visual movement perception processes (Kolers, 1967; Matin & Mackinnon, 1967). The dispute centered precisely on the issue regarding the retina mechanisms for movement perception in real and in apparent motion. Gibson (1968, 1979) himself raised the dispute when in his early experiments with motion he suggested that the perception of motion should be based on the study of the retina mechanisms (1968) and later on, with new experiments and new findings, he concluded that the perception of all events, real and apparent, depend on "the disturbances of structure on the ambient array" (1979, p. 170). The transformation of the visual array, rather than the retina mechanisms can explain the differences between real and apparent movement perception. This argument has prevailed and has been confirmed by all contemporary prominent scholars of visual perception mentioned above, and has been summarized by Murch (1973) as follows:

> There are meaningful differences between the two [real and apparent movements], particularly in the speed of displacement, since the occlusion and disocclusion of the background are continuous in real

> movement and discontinuous in apparent movement. Nevertheless, the transformations of the ambient array are very similar in both instances. Therefore, if real motion perception is the result of continuous experience with objects in transformations in the external environment, then the conditions of apparent movement would be those producing highly similar transformations. So similar, in fact, that the observer often cannot discriminate between the two. (p. 287)

Our experience with the various transformations of the ambient array of light which objects in the environment reflect, is all we can perceive in either case, real or apparent motion. Therefore, arguments regarding the relationships between real and apparent motion perception, among other things, reveal to us how significant reflected light is in the perception of still and moving objects as a syntactic factor in the construction of moving images. After all, it is light that we manipulate and control to generate the moving visual images of film and television.

The Syntactic Rules Governing Moving Images

The evolutionary changes that occur in nature provide the foundations for the understanding of the kinetic media of film and television. As it is evident that the observed changes of the natural phenomena are explained in terms of the laws of causality, so it is logically inferred that the changes of the moving images must be governed by the same logical evolutionary processes. On the bases of the theories discussed above and the analysis of their constructs, the syntax of moving images can be extracted and the grammar of the composition of moving pictures can be structured logically and evolutionarilly. Such grammar must also consider the existing perceptual, cognitive, and compositional factors of still visual images verified and empirically supported by previous research and experimentation.

Yet the element of motion is the new dimension, the new dynamic component added that enhances, completes, and redirects their potential applications. In its effort to bridge the syntactic rules governing still images with those related to moving images this section entertains the following questions: (a) How are time, change, and motion perceived and applied in motion pictures? (b) Which iconic levels of visual images are common to both still and moving pictures? (c) What specific points of view are mutually expressed in still and moving images?

Time, Change, and Motion

As it was pointed out earlier, motion implies change and change occurs in successive intervals of time. Therefore time is the essence of change sequence or motion. As Marr (1982) points out:

> . . .more so, perhaps than any other aspect of vision – time is of the essence. This is not only because moving things can be harmful, but also because, like yesterday's weather forecast, old descriptions of the state of a moving body soon become useless. On the other hand, the detail of the analysis that can be performed depends upon the richness of the information on which the analysis is based, and this, in turn is bound to depend upon the length of time that it is available to collect the information. (p. 162)

Arnheim (1969) also points out that motion, change, and time are interrelated and that one is not easily perceived without the other. Furthermore time, as a dimension of change involves the presence of things past (i.e., experiences stored in memory), the presence of things present (i.e., experiences of things happening now), and the presence of things future (i.e., experiences we expect to undergo in the anticipated causality of happenings). Not only does time determine the flow of change and motion, it also provides causality and logic to events and happenings thus providing an orderly, meaningful, and organic sequence of events (Arnheim, 1969).

The various types of time under which the media of film and television operate are, according to Zettl (1990): (a) *objective* also known as clock time, (b) *subjective* also known as psychological or emotional time, and (c) *biological* or physiological time.

Physiological time refers to the biological arrangements that determine the organism's changes such as eating time, playing time, seasonal time, and entertainment time. It is not so much the objective time or the emotional experience of time that motivates the actions of an individual rather his/her own biological clock that dictates change. This factor is an important syntactic component in moving image composition because, biologically, it is known that if the metabolic or physiological time for the perception and enjoyment of moving images is not appropriate communication breaks down.

Objective time is equally an important compositional factor in structuring moving images because it identifies the real time event and specifies the exact time it occurs. The media of film and television depend on real time for their operation and every hour, minute, and second of real time are revenues. Time means money to the expensive medium of film and television. More so to commercial television that operates on the marketing of time.

The emotional, subjective, or psychological time is even more significant as a syntactical factor in the grammar of moving images. In fact, the degree of the success of a film or a television program, and its aesthetic fulfillment, depend on the proper usage and manipulation of the emotional time of events involving the presentation and the visual narration of the programs.

The running time of approximately ninety minutes (in objective-clock time) is the normal rate of a film whereas the storytime—narrating the fictional events of the movie--varies considerably, depending on the script. The running time (actual length) as well as its storytime also depend on the nature and the objective of the program and they differ considerably from one program to another.

The control and proper manipulation of these three types of time are the prime tasks of constructors of moving images. The greatest obstacle, however, occurs in the control and the skillful manipulation of the timing of moving events and the temporal order of the succession of images, as it is explained in the last section of this paper.

The Iconic Levels of Moving Images

All pictures, by definition, are icons. They are representations of the things, the objects, subjects, events, and circumstances they depict. There are various means by which pictures are generated (such as paintings, drawings, frescoes, photographs, films, slides, video, holography, computerized images, cartoons), and each of these means constitutes unique media that generate them according to the medium's own use of its instruments, materials, and techniques (Metallinos, 1985; Tarroni, 1979). The communication objective of the pictures determines which medium should be used to convey the message. Consequently, pictures communicating religious messages are mostly religious icons, and frescoes found in churches. On the other hand pictures that communicate the benefits of a product are mostly colored photographs found in commercial magazines, television commercials, etc.

Although the communication objectives of each medium vary considerably, the iconic levels of moving images, regardless of the medium that generated them are symbols, abstractions, or representations (Dondis, 1973). The quality of the icons, their sizes, colors, and compositional structure are, of course, very important syntactic factors that must be considered when we analyze and synthesize moving visual images. However, the iconic level of a television or film image, that is whether the information communicated is an abstract image (e.g., a cartoon), a symbolic image (e.g., a stop sign), or a representational image (e.g., a photograph of an actor), is a crucial syntactic factor in structuring visual images in film and television. In fact, the entire anatomy of a moving visual message depends on these three levels of icon construction. This has been the practice of the great masters of still pictures who reproduced the phenomena of the real world (objects, subjects, and events) in their framed pictures (the visual field) abstractly, representationally, or symbolically.

Points of View in Constructing Visual Images

In motion pictures we have the ability to frame live action the moment it occurs and in accordance with our own particular point of view, by choosing to look at the action from far away (e.g., a long shot of a city), to look into the action (e.g., an extreme close up of one street of the city), to distort, change, and even reorganize the event by manipulating the recording facility and the medium (e.g., a superimposition of a man standing in front of the city).

When we frame the action from far away we look at the events totally objectively, as uninvolved observers or bystanders. We call this the *objective approach* to composing moving images and it is found frequently in film and television programs. These shots provide a panoramic vista that allows greater flexibility of movements of both the object photographed and the photographer. Such an approach sometimes is called the landscape, the environmental, or the establishing shot approach. It is an excellent syntactic rule in composing visual images because such an objective approach relates easily to the image composer's live experience with the phenomena in the visual world, while it offers greater area for free motion of events as well as the camera that depicts them.

When we frame the action from very close we look into the event totally subjectively, submergibly involved in the event as participants rather than observers, taking part or touched by the occurring phenomena. We call this the *subjective approach* to composing moving images and it is found readily in psychological film and television programs. This approach sometimes is called the inner landscape, emotional, or psychologically involving shot, and, this, too, is a powerful syntactic rule in composing moving images. The physical movement in the subjective framing approach is mostly minimal, or slow. However, the emotional involvement energizes the subjective time factor and creates its own unique feeling of events occurring in their own time and medium space, at their own speed, as it is expressed in intensive love sequences in film and television.

The third point of view in constructing moving images is known as the machine dependent or *medium creative approach* to framing and recording of an event. In this case the motion picture constructor does not simply observe or submerse into the event, but he/she uses the medium's own materials, instruments, and techniques available to recreate the event. In the example of the man standing in front of the city, the television's own uniquely available technique of chromakey (in which one picture is keyed into another), allows two different and separate environments to be simultaneously present in a picture, both live and both in motion. The creative point of view in constructing moving images is decisively downplayed and overlooked by conservative North American commercial or network television program directors whereas the experimental, underground, and unconventional videos (e.g., MTV) have used it to the point of obscuring it

(Metallinos, 1988; Zettl, 1990).

In summary, the syntactic factors of time, change, levels of iconic presentation and specific points of view in constructing moving images are commonly used and derived from the aesthetics of the arts and applied equally to the composition of moving images, in which motion is the basic syntactic factor.

The Specific Motions Used in the Construction of Television Images

As stated earlier, all three major theories, real, induced, and apparent, regarding the perception and comprehension of moving objects are important syntactic constructs for the creation of the grammar of moving images. Some additional types of motions, however, are also in operation when we are constructing moving images within the visual fields of film and television screens. We call them visual forces operating from within the concentrated space of the film and television screens and they are *main direction*, *magnetism of the frame*, *attraction of mass*, *asymmetry of the screen*, *figure/ground relationship*, *psychological closure*, *gestalt*, and *vectors* (Metallinos, 1978; Zettl, 1990). The derived motions from real, induced, and apparent, and the visual forms generated in the visual field are the following three specific motions that we must carefully consider.

The three specific types of motion are known as primary (or movement of objects), secondary (or movement of the camera), and tertiary (or movement created by sequencing images), (Arnheim, 1966; Metallinos, 1992; Zettl, 1990). All three are related to the syntactic factors of time, space, and change, to the three levels of iconic composition (symbolic, representational, and abstract), to the three points of view employed in constructing moving images (objectively, subjectively, or creatively). All three are interrelated; they work cooperatively; they rely on the presence and support of each other.

Movements of Objects or Subjects

The first movement we employ is the movement of the performers or objects themselves in their environmental space in front of the camera. This is the primary motion connoting the event itself and varies in speed, direction, and duration. That is, it can be a speeding car or a loaded truck driven slowly uphill, an object or performer moving towards the camera (inward movement) or away from the camera (outward movement), an accelerated (fast forward) or decelerated (slow motion) movement. Each of these motions constitutes the primary event and their application must be dictated by the script, determined by the producer or director, and justified. However, the aesthetic factor that justifies the application of the primary motion's numerous forms (fast, slow, upwards, downwards, inwards, outwards, etc.) must be based on the composer's own experience, knowledge, artistry, and skills. The syntax of motion in the kinetic media will provide such needed guidelines for the constructors of images (Gibson, 1950).

Like the various uses of the tenses of a verb (e.g., present, future, indefinite, past perfect), in constructing grammatically a sentence, so are the uses of various forms of primary motion in the construction of moving images. The choice in the selection of primary motions must be both logical (or syntactical) and consequential (or grammatical), providing the links that connect the parts of the visual sentence.

Movement of the Cameras

The second major type of motion unique to the media of film and television is the motion of the camera that generates a variety of movements and provides various points of view of the recorded event. The average film and television cameras are equipped to dolly-in or dolly-out, to zoom-in or zoom-out, to pan (right or left), to tilt up or down, to truck or arc in either direction (right or left) to pedestal up or down, and to be craned or boomed in all directions and at varied speeds (Zettl, 1993).

Empirical research on the value and the particular application of each of these camera movements is scarce and has not been considered by visual communication media scholars (Kipper, 1986; Miller, 1969; Monaco, 1981; Tiemens, 1970), although film and television production practitioners and media theorists have both experimented and theorized with them and about them extensively since the arrival of film and television. Visual communication media producers and/or directors should consider the following: (a) That the value and the subsequent application of each of these camera movements should be based on the logic and the situation demanded by life experience and the story. For example, a slow dolly-in rather than a fast zoom-in should be applied to a scene in which a performer (a teacher in a large classroom) walks slowly from one desk to the next, observing the work of the students. (b) That intuition alone or unintentional experimentation with any such camera movements is often undesirable and unreliable. For example, a sudden and unanticipated camera movement such as a fast pan or tilt is an unrealistic and hence disturbing act which diminishes, rather than enhances, the normal flow of visual communication. (c) That only after careful observation, constant application, and theoretical knowledge of the various effects (perceptual, cognitive, compositional, communicative) of each and every one of these camera movements should the producer of moving images apply them as syntactic factors of such images.

Movements Created by Sequencing Pictures. Editing.

A unique form of motion is created within the restricted space of the film and television screens when one visual image is followed by another. The succession or juxtaposition of visual images creates the illusion of motion. The specific direction of such motion is determined, mostly, by the index and motion vectors of the visual images themselves. The forces in operation that create motion are the psychological principles known as closure (Murch, 1973) and figure/ground interdependence (Bloomer, 1976). Due to psychological closure, when we see two pictures, one following the other, we have the tendency to continue the sequence to complete the action or the event illustrated by the picture. For example, if we see a picture of a man holding a knife, succeeded by a picture of a person wounded, we immediately conclude that the first person moved and hurt the second person. It is a cause-effect phenomenon that influences our perception of images. The second force in operation in the creation of motion of visual images is the change of the environment and its relation to the figures in front of it. For example, if we see a picture of a car in front of an office building, followed by a picture of the same car in front of a house, we assume that the two different frames of reference--the two backgrounds—represent the motion of the car from the work place to the house. Both perceptual forces are strong forces that generate otherwise unintentional motion when visual images are juxtaposed.

Yet when the succeeding of visual images is intentional the resulting motion is called montage, or editing. All montage is the result of motion generated by successive visual images appearing on the film and television screens, regardless of the time interval and the duration and speed by which they occur. It is beyond the scope of this paper to analyze the various forms of editing and to provide their syntactic values in the general grammar of visual communication media composition. Instead, this paper will concentrate on the compositional value and the syntactic significance of *implied*, *simultaneous*, *fast*, *slow*, *rhythmic*, *abrupt*, *transitional* motions that are available and are manipulated at will by the constructors of film and television images.

Implied motion exists in all still art forms such as sculpture, painting, and photographs and it has been known to artists since the dawn of civilization. By manipulating the various visual elements within the visual field the masters of still art have managed to create a sense of motion in otherwise motionless pictures. The graphic forces used to create the illusion of motion vary but the most commonly used are the various directional lines known as vectors (Zettl, 1990). Vectors are not only the strongest indicators of direction, they are the prime generators of implied, inferred, or imaginable motion. The eyes of people of a painting looking towards a direction, fingers pointing, arrows indicating an area, etc., are either graphic or index vectors, which imply motion as they point towards a general or specific direction.

Motion vectors created by moving images within the screens in film and television are, of course, the strongest indicators of direction but they are also indicators of the degree of forcefulness or magnitude of the movement. Continuity and converging vectors are also strong indicators of implied motion that is extensively used in still and motion picture composition (Bloomer, 1976).

Simultaneous motion occurs when both the frame of reference (the background) and the event (the figure) move simultaneously as for example, in the case of an airplane moving in reference to the sky and the passengers within the plane in reference to the interior of the airplane. Known also as motion paradox this type of motion is very common and is constantly present in recording moving images in which both primary and secondary motion occur simultaneously. Simultaneous motion is a powerful syntactic tool in the hands of moving images directors because it creates this motion paradox in which an object can be interchangeable in motion and at rest at the same time (Zettl, 1990), depending on what frame of reference the viewer chooses to consider in the images he/she observes.

Fast, or *accelerated motion*, is also a powerful syntactic construct of moving images and has been used, extensively and often successfully, in films and in television programs in such scenes as car chases, car and horse races, airplane combats, etc. The movements of objects, subjects, and events are sped-up, creating a faster than normal flow of action that exaggerates motion and reinforces the meaning, the visual message of the event. Accelerated motion is an excellent indicator of the passage of time when used to speed up a naturally slow process such as the blooming of a flower, the gathering of clouds before a storm, or the seasonal changes in the present. The manipulation of accelerated motion by the medium of film has been applied successfully in comic scenes (e.g., the Charlie Chaplin movies) or dramatic scenes (e.g., the famous Eisenstein movies). Accelerated motion is an excellent syntactic factor that constitutes an excellent moving image aesthetic agent when it is not used solely to impress or to attract the attention of viewers (Metallinos, 1989).

Slow motion is also a unique feature, a syntactic construct of moving images available to film and television directors to be used when the situation demands it. The compositional value of slow motion is very significant when it is used to reinforce the meaning of the visual message, rather than to obscure it. For example, if the communicative purpose of slow motion is to slow down the action so that viewers can see the details of an event that occurred very fast, such as a car crash, the application of slow motion is appropriate. On the other hand slow motion should never be used to break the normal flow of a scene if the ultimate purpose of the scene is to build up tension. Although the application of slow motion is found in numerous films and television programs of considerable notoriety, its best usage and value have been in experimental, instructional, educational, and documentary programs such as medical and children's programming.

An extreme form of slow motion is the *freeze frame* also known as *suspended* motion, or *arrested* motion (Zettl, 1990).

The perceptual and emotional effect of the freeze frame is that of suspending an action that wants to continue. It is a useful syntactic factor that provides a sense of suspense, tension, and curiosity to the visual communication circumstance when used sensibly, according to the demands of the script, and tastefully.

Rhythmic motion is the characteristic reoccurrence—in equal temporal intervals—of an event and refers to the flow of the segments of the event (Zettl, 1990). The equal temporal intervals that determine the rhythm and set the pace of the program generate the presence of a motion, physically or emotionally. Music videos are the best examples of the use of rhythmic motion. They are transitions between images, scenes, and sequences that are detectable by the particular rhythm of the musical piece. Once the rhythm of a musical piece is set and the pace is established, it is difficult to break it. Physically and psychologically we submerge to the flow of the event. Rhythmic pace is a strong motion syntactic factor also used extensively and quite successfully in television commercials. However, the establishment of the rhythmic pace, and its subsequent use and control, are not easy tasks and require both "sensibility" and "experience" (Zettl, 1990, p. 281).

Abrupt or *sudden motion* occurs when we suddenly interrupt the normal flow of an action and cut to a new, unexpected environment and event. There is still implied motion, which is mostly created by psychological closure, but the normal expectation of the occurrence of the old event is interrupted by the sudden appearance of a new event (Tiemens, 1994). In the media of film and television cutting from one picture to the next without the proper warning and anticipation, creates the abrupt motion, or stopping, between shots. Cutting from one visual image to the next is the most common editing technique in television and film. However, if the forthcoming image is not anticipated by the viewer the sudden motion of cutting creates two serious problems which interfere with the communication process. First, the surprise creates the so-called "jump-cut" in which not only the normal flow of action is interrupted and a new environment appears, but the normal directions of the visual elements within the picture field are scrutinized, resulting in unrelated and unrealistic jumps (Zettl, 1990, p. 290). Second, the jump cut generates the motion of a missing action between the preceding event and the one that follows. If viewers are unable to fill-in the missing link that connects the two events, due to the sudden change of the cut, they are disoriented and disturbed. Psychological studies on this issue have shown that abrupt motion generated by cutting should be avoided in programs addressed to preschool children and in programs addressed to those who are visually illiterate or unfamiliar with the media of film and television (Goldberg, 1951; Penn, 1971).

For advanced and visually literate film and television viewers the sudden motion created by the cut between pictures is both acceptable and at times welcome. It can be used to increase viewers' attention and involvement with the program. As Zettl (1990) suggests:

> The cut violates the expected smooth continuity and jolts our perceptual complacency. At the same time it manipulates the character's irrational "jumps" and compels us in a shorthand way to take notice of his or her progressively labile emotional state of mind. (pp. 290-291)

Transitional motions are collectively all other motion effects created by the juxtaposition or sequencing of visual images by way of the unique hardware technologies of the media of film and television such as the *dissolve*, *superimposition*, *fade*, *wipe*, *shrink*, *stretch*, *flip*, *tumble*, and *glow*. Whereas the dissolve, superimposition, and fade are normal transitional modes to both film and television, the rest are special transitional effects found in digital video facilities that vary in technological sophistication and capability. The rapid development of such transitional motion effects does not allow the close study of their syntactic value and their specific application. They are mostly used because they are available and to impress the viewers rather than for particular aesthetic reasons. Consequently, the syntactic value of the dissolve, superimposition, and fade which have become classic transitional devices in film and television will be discussed.

Defined as the gradual transition from one visual image to the next during which the visual elements of the first image temporarily overlap with the visual elements of the second, the *dissolve* is a commonly used, powerful, and effective motion syntactic factor. It indicates the passage of time and the normal transition of events unfolding in front of the viewers' eyes as they occur. The duration of the dissolve, that is, how fast or slow the transition from one image to the next occurs, is a very significant factor to be considered because it alters the reason of its usage. For example, whereas a very slow dissolve temporarily replaces the superimposition and assumes its value, the very fast dissolve almost replaces the cut and assumes its value. The normal flow of the event and the action dictated by the script should be the guidelines for its use.

Superimposition occurs when one visual image is imposed over and blends with another—both visible at the same time and occupying the same visual space. The transition that imposes and blends the two pictures is the factor that creates the motion, which, when completed, becomes a freeze frame of two interwoven images. It is a significant motion component with a powerful syntactic value when its use is driven by logic, taste, sensitivity, and akin knowledge of the medium. It bridges two different worlds, events, and circumstances that occur simultaneously and at the present time. The superimposition has been applied successfully in dream scenes, flashback sequences, and other such cases where the past or the future need to be seen in the present time.

The syntactic value of the motion created by *fade-ins* or *fade-outs* is found in such applications as opening or closing a show, in terminating an event and starting a new one, and a plethora of other similar situations. In compositional terms the fade-in assumes the role of the opening of the chapter of a story and the fade-out acts as the closing of it. By appearing gradually from black (or nothing) to a visual image, we open the visual fields of film and television and we are ready to tell a story, to unfold an event. Conversely, by going gradually to black we finish the story, we end the action and conclude the event. Like the opening and the closing of a store, a theatrical performance, a church mass, a musical concert, etc., the syntactic value of the motion created by the fade-ins and fade-outs lies in the sensitive, skillful, and tasteful manner by which the opening and closing process are executed. In general usage, however, the normal fade-ins and fade-outs indicate the opening or starting of an event and its subsequent closing or ending.

In summary, all these specific motions used in the composition of visual images in general, and television pictures in particular, constitute the syntactic elements that construct the grammar of the moving images.

Conclusions

The discussions set forth in this paper center on the importance of motion as a syntactic component in the construction of moving images and the necessity to create a syntax of moving images to enhance the basic grammar of visual communication media.

The review of the theories of motion and moving images in the first section reveal that there are major perceptual and cognitive constructs in each of the major motion theories that comprise the syntactic elements of moving images. These constructs have been overlooked by visual communication media researchers and are rarely acknowledged by visual communication media theorists and practitioners.

The discussions of the syntactic rules governing moving images in the second section demonstrated that the bases for the construction of the syntactic rules of moving images derive from the study of still visual images and that the motion constructs constitute the parameters in which the grammar of moving image composition can be incorporated.

The analysis of the specific motions used in the construction of television images in the third section indicated that the constructors of television pictures can use a variety of motions in their synthesis of television programs—each of which has its particular compositional value and fulfills a specific syntactic purpose unique to the medium.

If we, as visual communication media theorists, wish to create a unified, responsible, and academically acceptable grammar of visual communication media, we should give special consideration and we should place more emphasis on the syntactic constructs of motion. The creation of the syntax of moving images will strengthen the foundations of the grammar of the visual communication media.

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Message Into Medium: An Extension of the Dual Coding Hypothesis

Timothy J. Simpson

Introduction

Among others, Paivio (1979, 1986) suggested that the left and right hemispheres of the human brain operate together to process visual and textual information. The difference between what Paivio suggested and the work of others was that he presented a model of the coding of visual and textual information called the dual coding hypothesis. This paper examines this theory from the perspective of a mass media professional (*i.e.*, a teacher) interested in accurately presenting both visual and textual material to a mass audience (*i.e.*, students). It offers an extension to the theory, based upon the various skill levels of members of the audience (students) at processing information, and it suggests a series of twelve practical suggestions to those encoding visual media messages which should increase the accurate integration of visual and verbal symbols and the likelihood of faithful communication between the encoder and the audience.

Also suggested is an extension of the mediated communication model of Anderson and Meyer (1988) which incorporates the twelve suggestions into the mediated communication process. Dual coding theory, as does every theory of how we codify information, needs a model of the communication process within which it can be effective. This particular model was chosen because classroom communication is a mediated process, operating, according to Anderson and Meyer, within the framework of a social action perspective. A more traditional view assumes the individual is the central component of the communication process, a "complete, intact and reacting intellect marked by capacities and predispositions that will respond with predictable outcomes given the right interpretation of content" (124). Their perspective calls for the individual to be perceived as an "incomplete, interacting and interpreting intellect, functioning within and enabled by strategic social action using the tactics of sense making to improvise the continuation of that action" (124). This second view is more in keeping with the way current education theories view the student, constantly interacting with class content, their colleagues, and their instructor to achieve the desired, and also constantly changing, goal of learning. This perspective, in effect, views the student as a communicator, a participant in the learning process.

The Dual Coding Hypothesis

The dual coding hypothesis states that we process information using two separate but interrelated modalities — the verbal and the visual. These two systems work together to allow us to make sense of our environment, although each has its own method of operation and procedures which govern them. Work conducted since the theory has been proposed has continued to support this dual processing system (*e.g.*, Mayer and Anderson, 1991, 1992, Sadoski *et al*, 1993a, 1993b).

Paivio uses two concepts to distinguish between the textual and the visual (which he calls the verbal and the nonverbal). These are the imagen and the logogen. The logogen is a representation of the verbal characteristics of a message, while the imagen is a representation of the visual elements of a message. Each of these has their own reference subsystem, where they are compared to other representations of their own type. In addition, they share another reference system which combines these two subsystems into a common reference system. The meaning which results from the evaluation of these is taken as the overall meaning of the message. It is from this process that the theory derives its name.

The theory itself is a synthesis of a great deal of research, and it is based upon a set of assumptions covering the properties and functions of the various component parts of the theory. It is a very thorough and complete presentation of a theoretical model which meets most of the demands of the person interested in studying the communication process, especially the encoding of messages. From the perspective of a professional communicator working in the mass media, however, it has a serious problem.

The theory does not take into account the variable abilities of people to process information. The younger a person is, the more they process information better in one modality than the other. That seems to hold across ages. That is a major concern in today's marketplace. The effect of media messages, especially the visual elements which so enthrall younger viewers, can be electrifying. And that effect has been taken by the young into all elements of their lives, including their "work" in this society, as students in a classroom. As we age, we do not seem to lose this ability, but instead we seem to develop complimentary verbal abilities.

This difference can be a considerable concern to the classroom teacher, especially for younger students. In spite of this, there seem to be some characteristics of both the imagen and the logogen which are useful in coding messages for both. These are offered below.

Suggestions

The following are offered as a synthesis made by the author of some of the ways imagens and logogens might be useful in coding messages within the classroom environment. Many of these have not yet been examined using empirical research methodology. In some, the research has been done, but either it has been directed into a communication context other than the classroom or it has been done within another discipline. In some cases the evidence is purely anecdotal. They are offered in the spirit of opening possibilities for inquiry.

1. Combine verbal and visual stimuli to make the message more memorable.

Since people use both imagens and logogens together, it makes sense to utilize both when designing messages. Research has shown consistently that this combination is the most effective in the accurate transfer of information (*e.g.*, Mayer & Anderson, 1991, 1992). Each receiver decodes connotations from messages which will be based upon the receiver's reference systems for those stimuli, and these will be different for each person. For example, two people may perceive only the visual stimulus of a flower, but each will perceive the resulting message differently because of the connotations that stimulus has for them individually. These personal connotations may be the message elements which makes that message more memorable for one person than for another.

Radio and television writers have known this for years. They've used elements, particularly those peculiar to the medium in which they're working, to keep the audience's attention while they add other message elements to carry the meaning they are interested in conveying. Entertainment need not be amusing, funny, or even cute to be effective. The criteria used by media professionals is that part of a message (usually the first section) has to engage the interest of the audience and hold that interest until the intended meaning has been imparted to the audience by that message.

2. Use stereotypes of both verbal and visual modalities together to convey a great deal of information in a short period of time.

Media use stereotypes to convey a great deal of consistent information in the shortest possible time. In many cases the stereotypes are interesting and have an entertainment value for the audience. One of the reasons stereotypes can be used in this way is because of the almost universal understanding of the characteristics which can be conveyed by use of a specific stereotype. For example, a redhead may be seen as an intense, more emotional person than a blonde to one person and not another, but the chances are both see the redhead as being more hot tempered. The temper is a primary characteristic of the redhead stereotype, while the more intense, emotional characteristic may be an association shared by a smaller number of receivers.

One of the ways media professionals have developed to accomplish a desired connection is to use several stimuli (imagens) which convey a similar meaning, but which also do not reinforce an undesired connection. By using several stereotypes at once, we can combine the effectiveness of that one characteristic, make it a bit more obvious to the audience that this is the characteristic upon which we wish them to place their emphasis. Other associations of that particular stereotype, which are not reinforced by the other stereotypes used, will be less effective because they lack the strength of numbers of the major association. For example the use of a female blonde stereotype to convey a materialistic person works when connected to several other stimuli, both verbal and visual (logogens and imagens) which also convey the idea of materialism but which do not share their other characteristics with the stereotype of the blond female.

The impression that stereotypes are negative has been created in response to the potential damage which can be done in using stereotypes and misrepresenting an individual in the process. While such an outcome is possible under the best of circumstances, the communication professional has an ethical responsibility to make the effort to avoid such associations. Within the classroom environment, a teacher has the same professional responsibility to see that stereotypes used do not create harm. They still will be used by the students themselves outside of the subject matter of a course. But the teacher can control the use of the stereotype in the instructional setting.

3. Whenever possible, tie the verbal stimuli to the visual.

Imagens and logogens should be connected to each other so that both coding processes yield complimentary meanings. For example, to use a visual image of a hamburger with change sitting next to it on the counter might not convey the impression desired when used by itself. But when the text suggests that this particular meal will save you money, the image which the visual conveys is clear and compliments the verbal message precisely. It is much more likely to be effective in conveying the desired idea.

4. Use the visual stimulus to convey a striking image, one that is easily retained, while using the verbal stimuli for the presentation of logical representations.

Mayer & Anderson (1991) used an animation of the operation of a bicycle tire pump to test the effectiveness of visual stimuli in making an effective impression on the viewer. Their results suggest that the imagen might be better used to provide a striking image, easier to retain than a logogen, than a verbal description. Many of the impressions people tend to gain come visually, as in the stereotypes discussed previously. We live in a visually oriented society, where the audience wishes to see for themselves. This applies not just to physical actions, such as the tire pump, but it can also be extended to the desire to see an event on a newscast rather than have the event described.

If that is true, where can the verbal message elements be most effectively used? Visual stimuli can show something, but the understanding of an event (its importance, the impact it will have on our lives) cannot be completely presented visually. We look to others, experts or those more knowledgeable in specific fields to give us that information. And we have become accustomed to receiving that information verbally. Therefore, the logogen might be more effective in conveying a logical and specific progression more concisely than an imagen. In other words, use verbal message elements which have persuasive powers, keeping the visual message elements for the striking impressions we wish to have receivers retain associations with that idea

5. To alter a receiver's reference system, use specific combinations of imagens and logogens designed to achieve long-term results.

All the research done on attitude change over the past several decades have shown that attitudes and behaviors can be altered.

Communication skills which are useful in these instances can be used successfully in changing the reference systems of any receiver. Obviously, some people accept these changes better than others. Outside classroom learning can be conceptualized in the same fashion, since this kind of behavior modification learning has been well documented. Inside classroom learning (*i.e.*, cognitive learning which is devoted to advancing knowledge and understanding rather than behaviors) has traditionally been more of a problem.

But cognitive learning can be conceptualized as a change in attitude, since several learning theorists have used changes in attitudes as a necessary precondition for a change in understanding, and hence a change in learning. In any case, there is little doubt that the reference systems may be altered over time, either deliberately or as a process of ongoing growth and development. The trick is to have these changes be ones which are intended, not those of chance.

These alterations in the reference systems (those involving the imagen, the logogen, and the combination of these two) are difficult to obtain. They require consistent reinforcement and adjustment, since any long-term modifications may be reversed involuntarily, as if by habit.

6. Imagens used alone create more misunderstanding than logogens used alone.

Paivio suggests that when we encounter an imagen alone our mind calls up a logogen from our memory or experience, and uses that as the complimentary side of the message which undergoes dual coding in conjunction with the original stimulus in arriving at an understanding of the message. Similarly, when we encounter an imagen, we call up words which we associate with the that image. In either case, we are developing our own, peculiar stimuli which we will use to determine the meaning of the message. It would seem that it would be advisable to provide both sets of stimuli so that we, as encoders, can be more in control of the associations which we wish receivers to use in deciphering our intentions rather than to allow the receivers to develop these self-generated stimuli without our guidance.

Also, the association of meanings with images is more imprecise than the associations which are made with verbal stimuli. Since these are subject to such wide variation, misunderstandings seem more probable than improbable. Logogens should have a better chance of achieving success in conveying an idea, but the evidence is very clear that the association of both, operating in tandem whenever we wish to pass on an meaning or an understanding has the best possibility for success. Consider the image of a beautiful woman used in an advertisement. Without a clue from the encoder as to how to interpret that stimulus, any number of possible outcomes is possible. However, when the receiver is guided to the meaning the encoder intended, the connection can be much more productive, *i.e.*, the product will be recognized and a complete sales message will have been presented.

7. Any visual learning which is likely to be effective needs to be tied to the utility of that imagen to the receiver.

If the receiver sees no immediate utility to the visual stimulus used, while learning may take place, it will not be processed as clearly and with the immediacy which would follow otherwise. Showing how to repair an automobile engine has little visual appeal to a person who sees no reason to learn to repair an automobile engine, although the intellectual information may be seen as interesting and informative. The understanding which results will not necessarily be achieved to the same degree as if the interest of the receiver had been to repair automobile engines for a living.

8. Verbal stimuli should be better able to convey concrete information, while visual images should be better at conveying more abstract thoughts and concepts.

It has been an axiom in public speaking classes for years that visuals are best used to convey concepts which are more general in nature. Verbal messages can provide specific detail in support of an idea better than visuals. When precision is desired, it is best to provide detailed information with the verbal message and to summarize the main point with a generalized graph or chart. This allows the listener to concentrate on the outline, the structure of the points, while keeping the oral senses tunes to the details which fill the gaps left from the visual. If the roles of the verbal and the visual are reversed, the listener has a much harder time processing the information.

9. New concepts form around both textual and visual stimuli.

It seems that there is little distinction between our ability to gain new concepts from both the verbal and the visual stimuli to which we are exposed. Some people seem to have a preference for one or the other, but this does not seem to be anything more than a preference. However, the age of the person may be an indicator of the preferences that person has for the manner in which the stimuli may be more efficiently utilized.

For the younger generation, it seems as if they depend upon the visual stimuli for identification of the new concept rather than the verbal stimuli, no matter how detailed, clear, and memorable the verbal stimuli seem to be. People entering the harbor at New York still seem to get their most vivid conceptualization of freedom and the guidance doctrine of this country from the Statue of Liberty, a strong visual image in this culture, rather than from the verbal message at her base. And from all indications, the MTV phenomenon seems to confirm that the younger generation prefers visual stimuli, even in a form such as music which has been primarily non visual until this generation.

10. Discrepancies seem to be better represented by visual stimuli rather than verbal stimuli.

This seems to make sense not only because of the differences in physical dimensions provided by visual stimuli, but also because the concept of discrepancy in our culture involves the idea of a physical dimension. Differences in attitudes, for example, are shown as differences between positions on a line, with the physical distance separating the attitudes more important in conceptualizing the differences rather than the verbal characteristics of the positions which might prove more useful in an analysis of the discrepancies.

Even in the case of verbal discrepancies, where no real physical dimension exists, people of all ages have shown a preference for the visual as the principle channel to convey this. We accept evidence of differences by seeing rather than by logically defining differences between ourselves and others, even when those differences seem to be in attitudes and values. While this may not necessarily be based upon the current culture's use of visual stimuli, such as TV, movies, posters, and so on, We also tend to wear visual representations of the differences between ourselves and others on our clothing and our possessions (bumper stickers, jackets, even underwear).

11. Anxiety and uncertainty reduction seem also to be better served by using both visual and verbal stimuli together.

One of the primary anxiety reduction techniques ask subjects to relax and place pastoral, soothing scenes into their minds while also using peaceful and soothing words and phrases. This combination seems to work very effectively.

Uncertainty reduction is used when a person wishes to t accept the consequences of a decision which they have already made. Although purely anecdotal, people seem willing to accept the uncertainty about life and its twists and turns in the form of visual rather than verbal stimuli. Some use the symbols of the Zodiac, some use the image of a pair of dice, some use the image of a professional at work, and so on.

12. It seems uncertain what part imagens and logogens play in determining more complex behaviors.

However, if this connection is consistent with the connection between stimuli and some of the more simple behaviors, it seems likely that some combination of both imagens and logogens determine how we behave in many of the circumstances we face day to day. Modeling behaviors seem to be formed more from observation than from description. Our manners and mores seem to be more developed visually rather than verbally. And our concept of everyday learning, even in the more abstract contexts, seems to be more grounded in visual stimuli rather than verbal stimuli.

The classroom environment, however, is a w place where we have deliberately matched verbal and visual stimuli together. Our concepts of competence and literacy are tested verbally more readily than visually in the more intellectual subjects, such as philosophy, social sciences, even the behavioral sciences. In this case it appears that logogens may be more acceptable as measures of competence than are imagens. However, at present the argument over the effectiveness of the learning which is expected to take place in the classroom is very heated. While this battle has been ongoing for many generations, the place of the logogen as primary stimulus within the classroom seems to be at stake in the outcome. And as a result, the use of more visually oriented methods of determining knowledge and ability may be coming into general use.

Mediated Communication Model

Anderson and Meyer (1988) have suggested a mediated communication model consisting of two parts: a content system and a reception system. The content is the message production system, while the reception system is used by the audience to make sense of the various stimuli presented to them as the message. This is a model which, in essence, . represents the communication structure of a decoder. Dual coding theory, however, best matches the structure of the encoder in the communication process, where the message is developed from the understanding which is the desired intent of the communication. But the process as a whole is a combination of these two halves. And any examination of the process needs to consider both parts in a coherent whole in order to be worthwhile. Therefore, the mediated communication model and dual coding theory need each other to be complete.

All of the suggestions given here were developed based upon the experiences and research associated with mediated communication, especially that gained from the broadcast media. To apply this to the classroom, the model and the theory need a common element, and that element is the classroom teacher.

A teacher sits between the content itself and the receivers, between the work of dual coding theory and the mediated communication model. This position is not available within the model as it exists. At best, given the constraints of the model, the teacher's position would be as a producer and transmitter of content. But this model does not consider that the mediator comes after the real source of the information, which remains hidden to the audience. As in the classroom, that source is never identified as such. The receivers must accept the mediator as the source, although seen as a complete system this is a little inaccurate.

To make the model more effective within this context, the following suggestion is made: Extend the model to cover the entire process from source of information to the audience. While this may seem unnecessary in the limited context of the broadcast media, in the broader context of other mediated contexts, such as the classroom, it offers the opportunity to present a more complete picture. It offers the chance to show the mediator as a member of another audience, albeit an audience of one. In that audience, the teacher uses the imagens and logogens in evaluating the message from the source(s) of the content to understand, and then, as a mediator, to reinterpret the content for the new audience (students). Without this step, we face the prospect of considering the mediator as a transmitter of content only, while in fact we realize that the teacher does not merely relay information. One of the main responsibilities is the synthesis of information and the re-encoding into a new message (for which the teacher truly is the source). It is only in this light that we may begin to see dual coding theory operate. And it will operate effectively in the classroom, if only we will give it the opportunity.

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Visuals for Information Access: A New Philosophy for Screen and Interface Design

Marshall G. Jones

Introduction

Computer-based Instruction (CBI) has undergone tremendous changes in the past decade. Changes abound in not only how the programs look, but in what the programs are intended to do. Most of us remember early pieces of CBI. They relied predominantly on text as the presentation medium, and interaction was limited to pressing the space bar to continue. These programs were linear in nature, and were limited in the types of information they could present, and the types of learning outcomes they could cover. Most of these programs were written for the computers that were available at that time. Computers such as Apple's IIe, and IBM compatible XT's were only capable of displaying minimal graphics, and relied predominantly on text. Interaction was limited in most cases to the available input device: the keyboard. Consequently, text based screens were controlled by keyboard commands.

With the advent of the first widely used graphical user interface (GUI) computer, the Apple Macintosh, in 1984, it became possible to do more sophisticated things with the computer. Graphics were easier to edit and include in programs. Old monochrome green or amber screens have yielded way for the high resolution display devices most of us use today. Additionally, input in nearly all computers today may be done not only from the computer's keyboard, but with the help of the track ball or mouse. Users can now not only click on the right arrow to continue, but also control the rate of presentation of digitized video and audio, manipulate data and information on the screen, and interact with the information in the program from a variety of perspectives. The way that computers may be used has changed drastically, and this change has had a dramatic impact on the use of computers as an instructional delivery system.

With the change in how computers can be used comes a change in how information appears on the screen. This paper focuses on the following three areas of designing information presentation:

1. Screen design literature is dated, and the existing guidelines do not allow for advances in computer technology;
2. Open ended guidelines may offer designers sufficient guidance for designing computer screens and user interfaces without stifling the

creativity of the individual designer;

3. The paradigm of static screens has changed to one of active, interactive, screens filled with dynamic visual elements.

The Literature is Dated

Heines (1984) wrote the book, literally and metaphorically, on screen design. For years his ideas were used by designers and teachers of designers used to guide their efforts in designing screens for CBI programs. While Heines' book served a great many people well for a number of years, his work was written relative to the available technology. This is also reflected in the lion's share of the research done in the area of screen design. Alessi and Trollip (1985); Bork (1987); Heines (1984); Hooper and Hannafin (1986); Issacs (1987); Morrison, Ross, O'Dell, Schultz, and Higginbothan-Wheat (1989); and Rambally and Rambally (1987) all conducted research in the area of textual manipulation as it applies to screen design. Once again, this literature is quite dated. The guidelines produced by this research suggested things such as never using itlaticized or bold text. This was certainly true for old monochrome screens, but the advice seems odd in the face of high resolution display devices.

Hooper and Hannafin (1988) and Hannafin and Hooper (1989) began looking at how the design of the screen could be used to promote and engage learners relative to individual learning styles. Keller and Suzuki (1988) proffered ways in which the screen could be used to motivate the user into using the CBI program. But all of these efforts were focusing on the screen as a static delivery system. A delivery system that would allow for the users to acquire information in a passive environment, sitting and reading and watching while they absorbed all of the designer ordered information in the program. While Jonnasen (1988) began to flirt with the notions of constructivism as it applied to CBI, and offered suggestions for how to engage learners in a more realistic environment, Grabinger (1989) began to look at the screens as a dynamic medium through his first efforts at multiple element research. But this research looked at the design of the screen as a static environment, and these guidelines provided designers with specific things to do when designing the screen. These specifics soon became outdated as technology rapidly out grew these recommendations.

User Interface Design

All of this literature focused on the design of the screen, and screens were seen as individual units linked together by proceeding through the information a screen at a time. However, in today's environments, windows overlap, multiple events can happen on the same screen at one time, and the user is faced with controlling not only a complex piece of software, but also a complex piece of instruction. Users control this complex environment through the use of the user interface (Jones, 1993). And while literature on the design of the user interface does exist, (Blaser & Zoeppritz, 1982; Schneiderman, 1987) it exists within the area of human computer interaction (Booth, 1989; Carroll & Moran, 1991; Diaper, 1987; Dumas, 1988; Eason, 1988) on topics such as system software design and application software design. Jones (1989) made an excellent effort in beginning to discuss user interface design in terms of CBI, but little else exists in the area of user interface design as it applies to educational software. The difference between educational software and application software and system software is immense.

Eventually, given enough time and practice, anybody can learn any interface-even MS-DOS. We become intimately familiar with how our systems work. We know what different icons mean, what commands we need to copy, move, delete and rename files. In the applications we use daily, we are comfortable in doing the things we need to do, and in experimenting with the software to do new things. We use these things almost daily. However, CBI is a one shot deal. The purpose of the software is not to create lifetime users. The purpose is to get the users into the program, teach them the things they need to know, and then get them out. Instructional and educational software is not used on a daily basis. Using the interface becomes more important because users need to understand it almost instantly.

Laurel (1991a; 1991b) has provided us with the most recent articulations of what user interfaces should do, but once again this focuses on areas that are not directly related to educational and instructional software. While it is possible to extrapolate much of this information to be applied to the design of educational and instructional software, the problem remains that there is a dearth of research into how the screen in a CBI program can incorporate a dynamic interface to promote the acquisition of knowledge to the end of promoting and improving human learning.

Broad Concepts Of Interface Design

Technology will move beyond any set of specific set of do's and don'ts for the design of the screen or the design of the user interface (Jones, 1993). While today we wrestle with digital video and multiple window, tomorrow we will be faced with virtual reality. All of these changes effect not only what the computer can do, but what can be done with education as it is delivered on the computer.

Programs such as IBM's *Illuminated Books and Manuscripts*, and *Columbus: Encounter, Discovery, and Beyond*, pushed the envelope of not only what had been done before technically, but in what educational software could be. While Heines (1984) recommended that screens have specific functional areas, or areas on the screen where information could always be found, these programs used overlapping windows and presentation areas that required the user to manipulate the information on the screen. These dynamic programs make it nearly impossible to say where things should go on the screen. As with any multiple windowed environment, it is ultimately the user who will decide what window is displayed, and when it should be displayed. And it is this new found control by the users that may drive a shift in paradigms from designer driven instructional delivery to user driven instructional delivery.

Jones (1993) proposed a set of guidelines for the design of user interfaces in computer-based learning environments. These guidelines do not offer the user do's and don'ts about what to do and when to do it (Hill, 1994), but, rather, offer the designer a set of issues to consider when designing the screens and ultimately the user interface for computer-based learning environments.

For example, one concept of interface design is browsing. Browsing allows for the flexible exploration of the content of the program through a variety of controls. Browsing can be done topically by providing users with a list of the topics covered in the program through the use of a menu (See Figure 1). Once a topic is selected, users can use methods such as clicking on right and left arrows to access related or extended material. While browsing should be flexible and exploratory, it should not be indiscriminate or uncontrolled. Users need to be able explore the program for new information, know where they found it, and be able to find it again. One common method of providing for browsing in a computer-based learning environment is through the use of menus, (See Figure 1) lists of navigational and informational choices, and right and left arrows, buttons on the screen designed to take the user to the "next" or "previous" screen (See Figure 2). With the advent of the GUI, and the power of the modern authoring systems, it is now possible for users to browse through the use of terms entered on the keyboard, through clicking on "hot word" as in a hypertext environment, by choosing from pop-up menus, or by clicking on a portion of a graphic to take the user to a variety of places. These interface elements are illustrated in Figure 3.

The guidelines for browsing are presented below. While there are other concepts of interface design (Jones, 1993), this example is included to illustrate what the concepts of interface design are intended to be, and, when coupled with the included figures, how they might be implemented.

Guidelines for Browsing

1. *Provide selectable areas to allow users to access information.*

Some possible selectable areas to consider are buttons and hot text within a text field. The location of these elements on the screen will depend on the available screen real estate and the function of the selectable areas. It is recommended that the placement of selectable areas be tested with users to find out what is the optimal location for them. The selectable area will be a control element for users to access information. The control chosen will depend on the task to be done. Be consistent in implementing particular controls for particular functions.

2. *Allow users to access information in a user-determined order.*

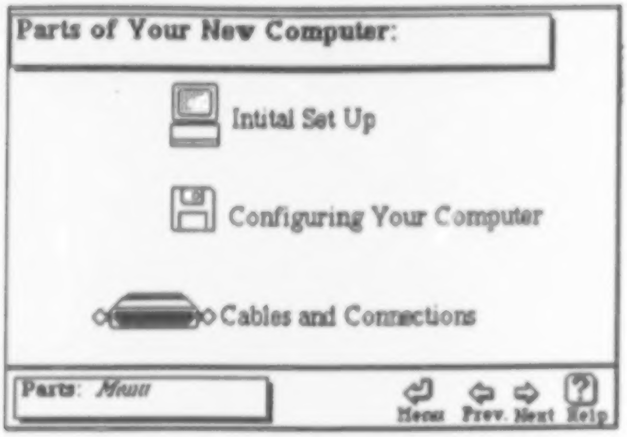
This may be done through topic indexes of all of the information available in the program, or through the use of different types of menus. Another technique to consider is allowing for user-entered search terms. Exploration should be flexible, and the controls for accessing information should reflect flexibility.

3. *Provide maps so that users can find where they are and allow provisions to jump to other information of interest from the map.*

Because the content of computer-based learning environments tends to be complex, using visual or iconographic maps may be too difficult to include and too confusing for users to understand. What we now consider as maps may have to change drastically. Text based indexes, outlines, and tables of content may be considered as alternatives to maps.

4. *Provide users with feedback to let them know that they must wait when significant time delays are required for the program to access information.*

Many programs use watch cursors, or text messages that ask users to "be patient." Another technique to consider is to offer users some type of visual stimulus to maintain their interest while the computer is preparing to present the requested information. However, visual


Parts of Your New Computer:

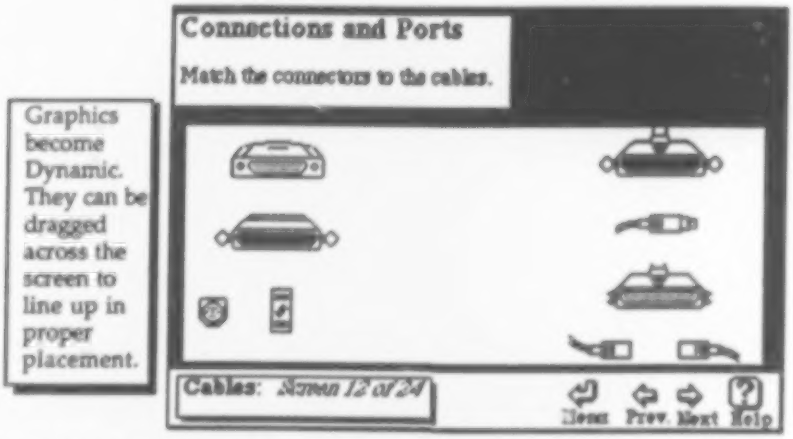
Intital Set Up

Configuring Your Computer

Cables and Connections

Parts: *Menu*

Figure 1. Browsing through a CBI program through the use of a menu.

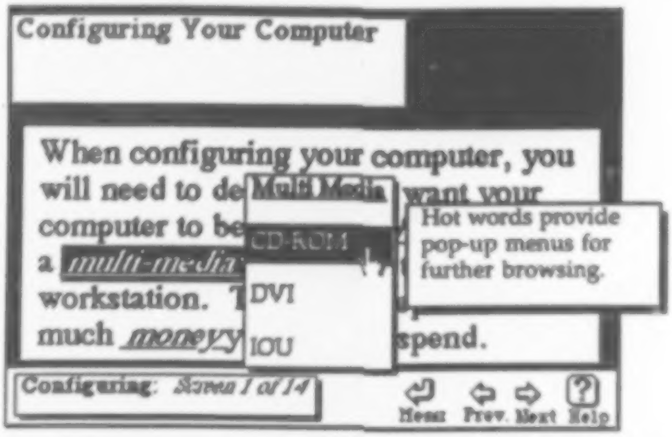

Connections and Ports

Match the connectors to the cables.

Graphics become Dynamic. They can be dragged across the screen to line up in proper placement.

Cables: *Screen 12 of 24*

Figure 2. Browsing through a CBI progam through the use of right and left arrow keys.


Configuring Your Computer

When configuring your computer, you will need to de want your computer to be a *multi-media* workstation. T much *money* y spend.

Hot words provide pop-up menus for further browsing.

Configuring: *Screen 1 of 14*

Figure 3. Browsing through the interface by clicking on "hot text" and "pop-up" menus.

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stimulus should be chosen carefully and kept as simple as possible.

5. *Provide users with information that lets them know that they are making progress.*

Because the information in computer-based learning environments is not organized sequentially, there is no determined order that users must follow through a program. Consequently users may feel that they are working in a program without making progress. Some techniques that may be considered to give users a sense of accomplishment are path history mechanisms that tell users what information they have seen, or visual cues that indicate progression. Another technique would be to break the program up into chunks that may give learners a feeling of accomplishment.

6. *Arrange information in a non-threatening manner so that users are not overwhelmed by the amount of information contained in a program.*

To accomplish this consider setting up information with an overview of a topic that acts as a top layer of information. As users need more information they can move progressively deeper through the layers of information. Moving through the layers of information could be done through the use of pop-up menus, buttons, or hot text.

7. *Provide visual effects to give users visual feedback that their choices have been made and registered by the program.*

Buttons, icons, and menus can be highlighted or animated to show users that a choice has been made. Keep the highlighting or animation simple. The duration of a highlight or animation should be long enough to be registered visually by the users, but short enough so that users are not waiting for an animation to be over so that they can get to the information they want.

Visual effects, such as wipes, fades, and zooms may be used to indicate access to a particular piece of information. The use of these visual effects should be consistent. Do not use them simply because they are available, but rather use them to indicate a particular action of the program. Additionally, be consistent in the use of a visual effect. If wipes are used when clicking on a right arrow, use them throughout the program. If zoom outs are used when clicking on a menu item, then use zoom ins when returning to the menu. Above all, make the visual effect have meaning and be consistent with its use throughout the program.

A New Paradigm for the Design of User Interfaces

Reiber (1994) makes the distinction between static graphics and animation. While this distinction is quite true, it fails to take into account the possibility of *dynamic* graphics. Dynamic graphics can be found throughout the computer-based learning environment. Graphics are traditionally thought of as a separate element of the screen. The purpose of the graphic has been to offer significant redundancy between the object and the text used to describe it. While this was true for early pieces of CBI, today's programs use graphics in a variety of ways beyond simply illustrating a point. Icons are a poignant example of this.

Icons are used to indicate to the user that a choice is available. Left and right arrows indicate that users may go "next" and "previous", hooked arrows indicate that a return to the previous menu is possible, question marks may represent the availability of on-line help, and directional arrows may offer the user the chance to see a map to help them decide where they want to go. While these graphics may be static, they are in fact dynamic as well. They show the user that a choice is possible. When they are selected, they may be highlighted to indicate that a choice has been made. When they are clicked upon, something happens: the user is carried to a different point in the program. The choice of what icon to use, whether or not to label the icon, and what icons are appropriate for a particular learning environment are of paramount importance.

Additionally, graphics may be interactive. Scanned images and clip art can have buttons layered over them, offering the user the chance to explore an image and receive further information.

Animations can obviously offer the user a dynamic element in the program. While research has shown no significant difference in the use of static graphics versus animation (Reiber, 1994), it is generally recognized that the use of animation can offer many subtle benefits (Reiber, 1994). When the animation is congruent to the learning task, it can offer instructional benefits to the learners (Reiber, 1990).

Graphics are not the only elements of the screen that can be dynamic. Text can also provide the users with options, choices, and navigational cues (Kahn & Landow, 1993). While text on the CBI screen has traditionally been used as a passive medium, it is now possible for the text to be an active part of the screen. Text formatting such as underlining, bolding, and italicizing can provide users with a different type of visual to be used when accessing information. The user can click on text to view graphics, see further textual information, activate a link to another section, and to activate a pop-up menu (See Figure 3).

The point is that the computer is a dynamic medium. Authoring systems make it possible for non programmers to develop remarkably sophisticated programs which are interactive and kinetic. Consequently, designers need to provide opportunities for the user to take advantage of its potential.

The paradigmatic shift that I am suggesting is one where we move away from thinking of screens as individual pieces of the program, and move towards thinking of screens as the thread that can hold the interface, and, ultimately, the program together. Deciding on a theme for a program can help designers pull the thread through the interface, providing the user with controls, displays, and informational elements which can keep the user interested, help the user find out where they are, and ultimately aid the user in the complex process of taking the information out of the program and integrating it into their own conceptual knowledge base. In short, the interface should not only guide the user and present information, but help in the process of promoting and advancing human learning.

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Visual Dialect: Ethnovisual and Sociovisual Elements of Design in Public Service Communication

Carole B. Schiffman

Graphic design is a form of communication by which visual messages are conveyed to a viewer. Critical to the communication process are the needs and visual perceptions of the viewer, for without them, the sender, or designer, has no defined message or visual language within which to transmit the message. Graphic designers, however, tend to generate public service materials with little regard for the needs or the unique visual world of the target audience. As a result, their products may be ineffective and, in the case of public service materials, critical health and safety information may be lost.

For purposes of social communication, graphics is a vehicle for communication, first, aesthetic reflection, second, and personal expression, last. Graphics for social communication may be seen as creative in that the designer must not merely express an individual world view, but must also recognize, incorporate, and express the world views of the audience to create new ways to resolve unique visual problems.

World views

Audience needs and views must steer the design process when constructing public service visual messages. Educated audiences, who are usually more verbally and visually sophisticated than those who have had limited access to educational opportunities, may be better able to comprehend visuals, such as culturally clever or abstract concepts, which require some level of interpretation or extend beyond their world view. In fact, advertising seems to capitalize on this by creating highly clever slogans and concepts that challenge sophisticated viewers by breaking through the information clutter to captivate and persuade them.

Public service communication, however, often targets less educated audiences who may be unable to undertake such challenges or too bogged down by other challenges of adjustment to take another one on. Therefore, designers must minimize challenges, or barriers, so that the audience will receive the message. Bertoline (1991) notes that the goal of the technical graphics designer is to enable the user to understand the visual product. Similar to technical graphics, public service graphics are designed primarily to inform or communicate by visual means.

When forms exists within the

world view of the designer but outside that of the recipient, communication may not take place. "The receivers' sophistication, or the relationship between the levels of sophistication of the conceiver and receiver, can moderate the encounter."

--Blasko and Mokwa, 1986

Thus, the absence of common frames of reference or levels of sophistication may limit communication.

In discussing world views or images, Forsdale (1981) notes that the background and accumulation of experiences differ for each person. Individuals from different cultures, therefore, see the world differently, comparing all messages against their stored images. "These images shape the meanings that we assign to everything" (Forsdale, 1981). It follows, then, that designers must adjust their perspective or view in order to recognize meanings within images in the same way that the audience does. They must react to the design elements that create these images as they are filtered through the social and cultural experiences of the viewer. Then, appropriate and useful visual communication solutions may be developed through the deliberate application of a variety of creative techniques.

Creativity in educational materials design

Couch and Miller (1991) note that instructional materials are often ineffective because they lack creativity. As part of their strategy to enhance creativity, Couch and Miller (1991) emphasize looking at things from new perspectives, a notion akin to the world view described by Forsdale (1981), i.e., being open to surprises and seeking multiple solutions by considering all alternatives. By constructing visual messages from the user's perspective, the designer will produce new solutions by using appropriate elements of design. As a result, communication will be more effective through the creative act of assuming a new perspective.

Bertoline et al. (1991) note that technical graphics education discourages creativity. Although apparently true, the extensive editing techniques they describe, requiring that the designer continually view things from other perspectives in order to achieve clarity of communication, are routinely used by designers of technical graphics and, based on definitions of creativity by Couch and Miller (1991), are inherently creative. Such characteristically creative orientations harness the abilities and foster the natural creativity of technical designers. Public service graphic designers would benefit greatly by using these same audience-driven technical design methods to create effective products.

Unlike technical designers, graphic designers are encouraged to be creative. However, in their search for innovation, they sometimes seem to equate creativity with obscurity. Such obscurity may be understood only by a select few who share the artist's particular interpretation of the problem or view of the world. As Forsdale (1981) observes: "We attend to communication that interests us or meets our needs, tuning out communication that doesn't; we perceive communication in ways congruent with our assumptions and needs." Effective communication, therefore, must be based on an understanding of the educational needs and visual perceptions, or world view, of the target audience.

Design elements as expressions of world view

Pettersson (1993) recognizes that a collection of visual elements (line, value, shape, color) when brought together may interact to form complete meanings through images. Such design elements may be manipulated to control and enhance messages (Bertoline et al., 1991; Burton and Wiley, 1990). However, different visual elements and their expressions of these can, as Schwartz (1973) might so aptly state, "strike a responsive chord" and "resonate" with different populations (Schwartz, 1973). The critical factor here is not the intellectual matching of facts between sender and receiver to evoke meaning, as in Forsdale's (1981) stored meanings within images, but the production of a responsive emotional effect in the recipient by a visual stimulus, also based on their world view.

Consider the sea of pastel colors and soft edges in the baby department of a retail store, the saturated hues of stained glass in a Roman Catholic cathedral, and the crisp, flat shapes in open spaces that brighten Japanese tea rooms. These distinct visual elements create a feeling independent of meaning that resonates with the intended user. These palettes of elements represent visual cuisines. A variety of dishes may be prepared within one cuisine, but a common theme of flavors ties them together, with preferences, or choices, by age, gender, and class.

We might call these visual fields of experience of the recipient the "sociovisual" and "ethnovisual" elements of design. They are the elements (color, line, shape, value) as they are affected by social (age, gender, class) or cultural (racial, religious, regional) influences. This "visual dialect" is to the target population what sociolinguistics is to language. When the palettes of elements and their chosen combination reflect, describe, and express the social and cultural world of the audience, they are appropriate and may be most effective.

Sociovisual and ethnovisual elements make a piece familiar and comfortable. Unlike the images themselves, they are reflected in the way those images are expressed as a collection of elements. They are the socially and culturally influenced language, or dialect--accent, intonation, inflections, colloquialisms, idioms, and vernacular. Curtiss (1991) contends that analogous aspects exist within verbal and visual languages.

Collections of characteristic sounds uttered in a foreign language do not produce a comprehensible language with meanings, but they do elicit a distinct overall feeling for the cultural presence. Similarly, collections of sociovisual and ethnovisual elements elicit a feeling for a social or cultural presence without communicating meaning within a visual language. Images are often meant to convey meaning, whereas elements often describe the boundaries of how those images will be expressed and may convey feeling independent of meaning.

Visual dialect describes the aggregate of the expressions of elements which compose the visual language. Whereas style fits a product into a mode, or classifies it, visual dialect describes it, creating a feeling of the mode through manipulation at its most elementary level. Style may refer to anything from a period of time (Renaissance or Baroque) to a movement (Cubist or Minimalist). Dialect is solely dependent on the expressions of the elements and the emotional response, or affinity, of the viewer to the collection.

The health posters in Figures 1 through 4 are all targeted toward the same cultural group, African Americans, but are worlds apart socially. Close visual dissection reveals that each has a background of soft lines of pastel colors swirling behind images of African Americans of different ages engaged in various social activities. Yet each carries the same overall feel. The colors (blues and yellows), values (pastels), direction (circular, swirling), and line (softened), however, are the same. Even type style is the same: slogan in black sans serif, text and tag line in black serif. Since typefaces are design elements in themselves, it seems logical that they should be appropriate for their intended audiences, perhaps composed of bold, wild elements for teenagers and highly contrasted, larger styles for older adults.

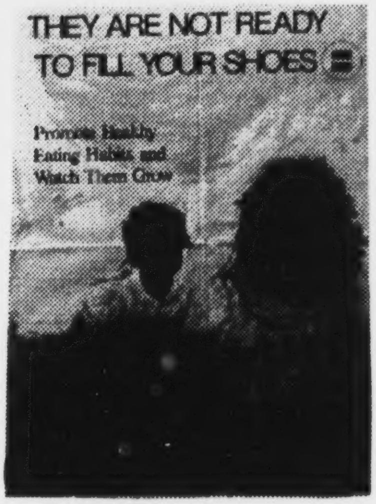
THEY ARE NOT READY
TO FILL YOUR SHOES =
Promote Healthy
Eating Habits and
Watch Them Grow

Figure 1

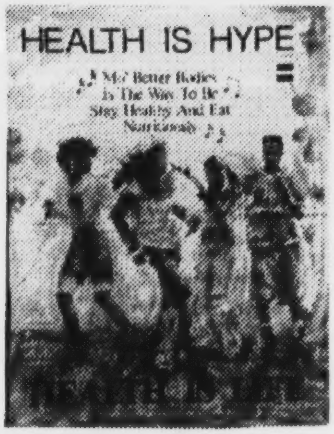
HEALTH IS HYPE
=
Stay Healthy And Eat

Figure 2

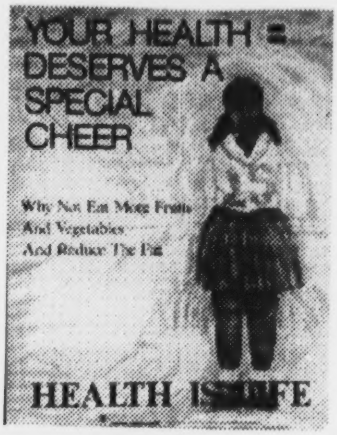
YOUR HEALTH =
DESERVES A
SPECIAL
CHEER
Why Not Eat More Fruits
And Vegetables
And Reduce The Fat
HEALTH IS LIFE

Figure 3

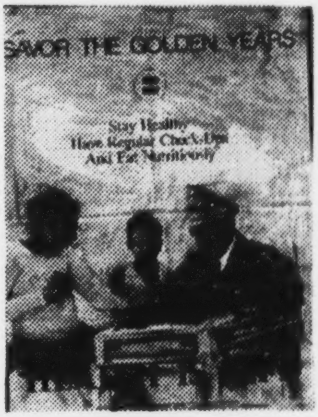
SAVOR THE GOLDEN YEARS
=
Stay Healthy
Have Regular Check-Ups
And Eat Nutritiously

Figure 4

Figure 2, the "Health is Hype" poster, shows a wild image of teenagers dancing in a nightclub. The image and the nature of teenagers as they express themselves and choose to relate to the environment contrasts sharply with the soft colors and controlled movement of the painted lines of the background. Would teenagers be attracted to such a classical, European style of illustration?

We might question whether the impressionistic style and pastel palette used on all four posters would be effective for such different social groups. Is the impressionistic feel African-American, or is it the designer's personal taste? Do we encounter this classical, impressionistic feel in African American churches, homes, clothing? Would a visual dialect derived from kinte cloth, for example, be less discordant within this visual environment? The visual style may vary, but the dialectical elements can be extracted and carried through.

Furthermore, as with many ethnic groups, African-Americans are defined by rich, unique, visual cultural expressions. Designers must capitalize on these links to effective visual communication.

It is critical to remember that, as Forsdale (1981) notes, we selectively process those images that reflect who we are. Clearly, children, teenagers, the elderly, and young mothers exist within radically different worlds; each will be drawn toward radically different images and, consequently, visual elements; and each requires an individual design based on an individual world view.

Figure 5, targeted toward poorly educated Mexican American women, gives a graphic representation of the following public health message:

> A health alert for pregnant women. Soft cheeses can be harmful to your unborn baby. Use cottage or hard cheeses instead.

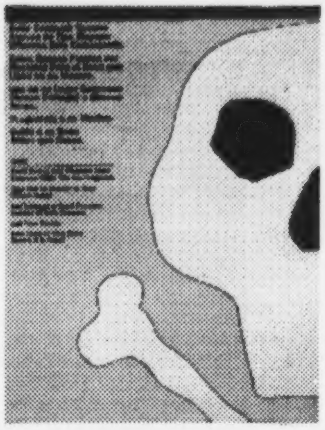

Figure 5

Illustrated by a highly simplified drawing of half of a black and white skull and cross-bones on a yellow background, it is essentially composed of four dominant shapes: a piece of a long bone, the right half of a pear-shaped skull, one round, black eye socket, and half of a triangular, black nose socket. This collection of lines and shapes is highly abstract to the point of being obscure. Does this combination of elements successfully communicate the message to eat hard rather than soft cheeses while pregnant? Not only must the image be recognized as a skull and cross-bones, but it must carry the same meaning to the viewer as it does for the artist. This is all compounded by the fact that the meaning of death hardly communicates the complex health message intended, even for the most sophisticated of viewers. Even more primary, would this

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palette of design elements (line, shape, color) resonate visually with the intended audience? Would these expressions of the basic design elements -- the look, the feel -- be attended to by the audience? Do they conform to or conflict with the visual environment?

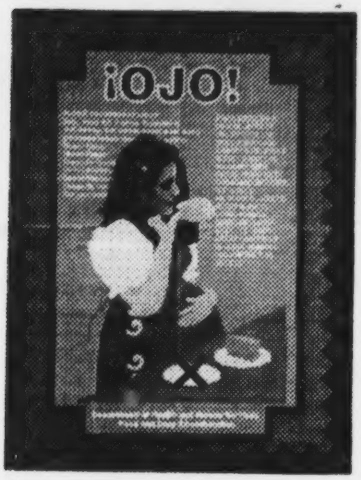

Figure 6

Figure 6 represents the same health alert; however, the image is framed by more traditional looking Mexican design elements. Brightly colored in saturated purple, blue, pink, and orange, with geometric zig-zag shapes, this image of a young, pregnant woman reaching for hard yellow cheese, and a plate of soft cheese within a red circle with a line through it, is based first on the communication need. Inherent in this case is a clear sense of purpose, or function, based on the world view of the user. This view dictates the visual dialect, which guides the composition of the design elements within the piece. Specifically, user-appropriate form (visually familiar elements and subsequent imagery) is applied to user-driven function (educational need). This marriage of form and function should be comfortable, or visually ergonomic, for the user.

Summary and conclusions

Designers must meet the viewer on the viewers' turf. The challenge is not how to actively captivate the audience's attention, but how to make the information easy to comprehend and absorb; so unobtrusive as to fit in, or blend into the viewer's world rather than barge in. If done well, vital health and safety educational materials, especially for special populations, should present no challenge for the viewer to comprehend.

If we lay all the visual elements, or design variables (texture, color, shape, size, line, value) on the table, challenge and restate each of them by using our audience's visual dialect, we may render new creative views that are compatible with our audience's world view rather than our own. Bertoline et al. (1991) note that technical graphic designers must manipulate graphic elements in order to communicate as clearly as possible.

Graphic designers must recognize the sociovisual and ethnovisual elements of design which comprise the visual dialect of their audience. By dissociating themselves from their personal world views and remaining open to using their audience's visual dialect, designers may generate new images or ideas from different perspectives.

Visual editing can help create a better draft--a better starting point after focus group research and before field testing.

As with written stories in which clarity of communication is enhanced by editors, a similar process of visual editing is needed for design, perhaps by art directors. However, visual editing must go beyond such basic tenets of design as balance, color theory, and Western aesthetics.

In a society that is becoming more and more heavily dependent on images, the visual efficacy of print images will become increasingly critical. We must recognize and capitalize on our recipients' unique world views, particularly as the population becomes increasingly diverse, so that we can effectively respond to their needs and accomplish our educational goals.

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FIGURE LEGENDS

Figure 1. Department of Health and Human Services and The Urban League. Young African American cheerleader.

Figure 2. Department of Health and Human Services and The Urban League. African American teenagers dancing.

Figure 3. Department of Health and Human Services and The Urban League. Elderly African American men playing a game.

Figure 4. Department of Health and Human Services and The Urban League. African American children trying on adult shoes.

Figure 5. U.S. Food and Drug Administration, unpublished. Half skull and cross-bones image.

Figure 6. U.S. Food and Drug Administration, unpublished. Pregnant Hispanic woman eating a taco:

Figure 7. U.S. Food and Drug Administration, unpublished. Hand with names of cheeses printed in Spanish on palm.

Approaches to Visual Communication Media Criticism and Their Application to Television Genres

Nikos Metallinos

Abstract

Several schools of thought regarding media criticism have emerged during the last decade derived from diverse disciplines and literary sources. To examine their application to the visual communication media arts such as film and television genres, this paper (a) reviews the literature of media criticism, (b) discusses various approaches to visual communication media criticism, and (c) provides examples of the application of existing visual communication media approaches to criticism. This paper suggests that the development of visual communication media criticism is directly related to and depends upon the development of verified theories of the various visual communication media arts.

Introduction

Whereas literary sources referring to criticism of the arts and literature are plentiful and easily found, research findings that refer to critical methods of visual arts in general, and visual communication media arts in particular, are disproportionately limited. Literary criticism methods that analyze, evaluate, and interpret such forms as poetry, essays, novels, chronicles, etc., and fine arts criticism that evaluates such conventional art forms as painting, architecture, theater, film, music, sculpture, etc., are already established as unique academic discourses; they are readily available and widely publicized because these fields are founded on repeatedly verified theories. On the other hand, the noticeable shortage of genuine visual communication media arts critical methodologies is due to the lack of scientific theories that support their foundation across the board. Whereas it is true that such visual communication media arts as photography, theater, and film, for example, are based on verified theories, as academic disciplines such new visual communication media arts as television, holography, computer graphics, etc., lack empirical research findings in support of the constructs of their basic theories. Consequently, the development of an academic discourse such as the study of the visual communication media arts is directly related to, and influenced by, the development of critical methodologies that analyze them. Could the opposite be true?

This paper argues that the development of genuine critical methodologies for the evaluation of the various genres of visual communication media arts will contribute, decisively, towards the development of scientifically sound theories governing the field of study known as visual communication media arts. It suggests that by reviewing the existing methods of art criticism in general, and examining the critical methodologies scattered in such areas as communication, mass media, mass culture, popular arts, etc., we could end up with those standards of criticism that are most applicable and most appropriate for the evaluation of the various products of visual communication media. Such evaluation standards could become the constructs from which the major theories of the field could be developed since the main objective of critical inquiry is to create the standards for the evaluation of an art form. These standards become the independent variables in the verification of theories stemming from experimental research methodologies in those cases in which such empirical research is lacking. This is precisely the purpose of the empirical research methodology known as descriptive, or critical.

In support of the argument that the development of genuine critical methodologies will, retrospectively, contribute towards the development of the field of study known as visual communication media arts, we must first examine briefly what constitutes this field, we must then define and discuss the use of the term's *approaches* (as opposed to *genuine critical methods*) and, finally, we need to review the areas from which the standards for the evaluation of visual communication media art forms must be drawn. After that brief introduction we can examine the various approaches to visual communication media arts criticism and their application to various television genres.

The Parameters of Visual Communication Media Arts

What constitutes the field of visual communication media arts? Collectively, the media of painting, photography, film, television, holography, computer imagery, and multimedia constitute the field of visual communication media arts. Cartoons, drawings, photographs, frescoes, icons, film and television programs, holograms, video games, some forms of advertising and some material on the internet are visual communication media products, objects, or events that are seen or seen and heard. They are visual images or pictures with either apparent or implied motion and sounds. Their main purpose is to communicate messages either symbolically (i.e.,. the dove conveying peace), or as representations of objects or events (i.e., a photograph of a person), or as abstract forms of an object or event (i.e., a cartoon or a drawing of a tree). They are the products of media that employ their own instruments, materials, and techniques in the construction of the arts, events, or objects.

As a field of study, the visual communication media arts embrace such related disciplines as visual and auditory perception, communication, sociology, media technologies, art criticism, psychology, visual anthropology, and a host of others. It is mostly concerned with pictures and the ways that they are structured and delivered to communicate concepts, emotions, thoughts, and so forth. The total communicative effect of the visual media arts often depends on the skill, knowledge, inspiration, and sensibility of the media artist. In short, it relies on the artistic merits of the media product and this is of paramount importance to the visual communication media field of study.

Critical Approach Versus Critical Method

Why use the term approach, as opposed to critical methods? The term approach is preferred for the following reasons: (a) An approach is traditional in that it originates from a known, and often well established, school of thought, whereas a method is a technique by which the critical process is achieved after the medium and its products have been accepted. (b) An approach to visual communication media arts criticism places the emphasis of the critical inquiry on a crucial aspect (mostly on the message or content), whereas a method of criticism of the visual communication media arts considers the medium as well as the audience. (c) Whereas an approach is basically built on reasoning and inferences to develop its argumentation (linear process), the true critical method is an in-depth or vertical process resulting from the diverse arguments on production, audience, and ideological factors, all of which are necessary for the effective analysis and evaluation of visual communication media products. In short, it is the approach to visual communication media art criticism that generates the method and not the other way around. As soon as visual communication media art forms (i.e., documentaries or westerns) create their genuine critical methodologies, they are bound to be considered unique art forms encompassing their own artistic elements and appreciated for their own aesthetic merits.

Selection of Criteria for the Evaluation of Visual Communication Media Arts

Where are the standards for the evaluation of visual communication media arts to be found? A meaningful discussion of what constitutes the standards for the evaluation of a particular film or television program must start first with the explanation and understanding of the generic terms *media*, *media products*, *communication media programs*, *visual media arts*, to mention only the most commonly used terms in media criticism. The responsible critic and/or evaluator of such commonly produced visual communication media art forms as film and television programs should obtain complete background information of these terms in all their ramifications. The literature is plentiful and the various sources are easily accessible. Therefore, only the basic concepts of these terms will be reviewed here as they relate to the creation of the standards for visual communication media criticism.

It is known that the term *media* refers to channels that convey messages for mass audience, as well as to the primary electronic channels that mediate communication in other contexts (Scodari & Thorpe, 1992). Television, as one of the most prominent visual communication media, is a mass audience oriented medium, mediating messages to vast, diversified, and heterogeneous audiences. This factor is crucial for the development of television criticism as a visual communication medium.

Media Products such as films and television shows are the artifacts produced by the media of film and television. The threefold process of *production*, *transmission*, and *presentation* of the visual communication media programs involves a network of institutions and people that the critics must consider. For example, the production process of television programs involves the establishment of powerful corporate television networks and media institutions with people working in the business, technology, or creative areas of the medium. Knowledge and understanding of the production units and the laws that govern them as institutions are necessary standards in media criticism. The transmission process of television programs arranges the means by which they reach the audience such as regular broadcasting, cable, close circuit, and pay television, and direct satellite broadcasting. This, in turn, decides the nature of the particular program in relationship to its intended audience. This is another important standard that the media critic must consider. The presentation process of the televised program is yet another key factor in media criticism. It decides the scheduling of the particular program that, in turn, determines the type of program presented.

The generic term *communication media*, in the context of the present discussion, refers to the ultimate function of all media, and particularly the visual communication medium of television to mediate or communicate messages to a vast audience. The communicative purpose of the medium, therefore, is unquestionable. The fact that all visual communication media, and particularly television, are exposed to a great number of obstacles that hinder the communication process needs to be emphasized. From the vast literature in the field we have learned that the communication flow can break down in any stage of the process. For example, it could be that the cause of the breakdown occurred in the *sender*, the message area, in cases in which the issues mediated are not clear, cohesive, or interesting. It could be that the images, the pictures, technologically and artistically, are not faithful, clear, or truthful representations of the intended message in which case it is the *medium* that causes the breakdown of the communication act. Perhaps the *audience*, at the receiving end of the continuum was not ready or capable of translating and comprehending the mediated message and remained, therefore, unmotivated by the program. This motivation, translated in communication media terms as feedback, is another crucial factor involved in the communication process that may cause its breakdown. In the case of television watching, the feedback is indirect and communicated by the switching of the channels, anger, disappointment, or discomfort of the viewers. The various stages and areas in which the communication breakdown could occur are indicated in the visual communication media model. We call the breakdown noise interference that can occur in any of the features shown in the model below. It usually occurs in the transmission and reception stages and for this reason *noise* has been placed between the generated visual message, the channel, the receiver, and the feedback areas (see Figure 1).

The popular visual communication media of film and television consist, for the most part, of images that move and are enhanced with audio, three elements that are unique to these two media and constitute the bases for the critical evaluation of the programs they produce. Visual images tell the story. Depending on the way that they are presented on the screens (e.g., as long shots, medium shots, close-ups and zoom-ins), and the sequence they follow (e.g., cuts, dissolves, fades), pictures constitute the narrative aspect of the show. Obviously, the visual communication media program critics, particularly of film and television, should be aware of both the technology and the artistry involved in the creation of the images of the program. The narrated text (script), along with various other natural or added sounds, support the visual images to tell the story; they assist in the development of the characters, help to establish the atmosphere of the program, and enhance the mood underlining the program. Naturally, the visual communication media critics must have knowledge of script writing, story

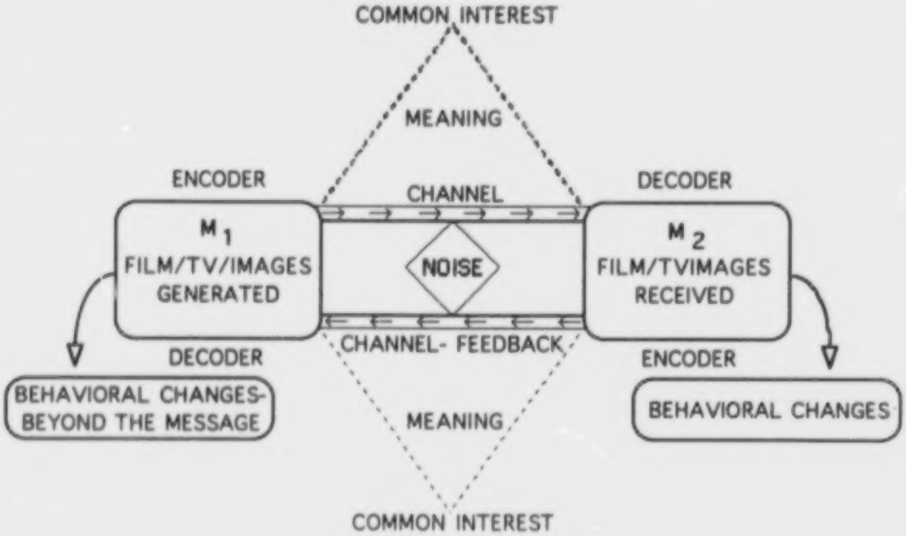

Figure 1. Visual Communication Media Model

and character development, the functions performed by various sounds as well as their technology and artistry in the production of the program. Finally, the motion of the images that creates the sense of liveliness and reality on the screen and provides depth to the pictures is yet another factor that visual communication critics must acknowledge. Critics must explain how motion helps to create, technologically and artistically, the program and they must be able to comment on the importance of motion in the perception, recognition, and artistic success of the film or television program. In summary, this brief review of (a) the parameters of the field of visual communication media arts, (b) the distinction between critical methodology and approach to criticism, and (c) the areas from which the standards for criticism must be drawn, provides the necessary background for the discussion of the approaches to visual communication media arts criticism that follows.

Criticism Approaches and Their Application

As stated earlier, the most representative media of the field of study known as visual communication media arts are film and television, and between these two media the most popular, the most widely used, and the most powerful is television. Therefore, it demands greater attention, a closer look at the products it produces, and better consideration as an art form. Since television theorists and researchers have not yet managed to organize its numerous constructs so that the concise theories that support the medium can be formalized, the development of appropriate critical methodologies might be the way to close the gap.

From the traditional studies of the arts, communication, mass media, popular arts, public or pop arts, various approaches to television criticism have emerged. Although not fully developed, one can find in today's literature a variety of sources discussing television critical techniques, inquiries, reviews, reports, commentaries, few of which are generic television critical methods, as described earlier.

The serious efforts during the last fifty years of a considerable number of television scholars, media critics, observers, communicators, media analysts such as Adler and Cater (1975); Cater and Adler (1975), Cawelti (1971, 1976), Crombeck (1984), Fiskie (1987), Fiskie and Hartley (1978), Hadas (1962), McLuhan (1964), Newcomb (1974, 1987), Rybacki and Rybacki (1991), Scodari and Thorpe (1992), Seldes (1956, 1961), Shayon (1962, 1971), Smith (1980), Vande Berg and Wenner (1991), and many others, have resulted in the formation of a plethora of critical approaches to television programs that are reviewed below. The variety of approaches and their numerous applications to existing television programs suggest that unless the emphasis shifts from its present linear or content oriented practice to a more appropriate for the medium's idiosyncrasies vertical one, television criticism as an academic discourse will not be achieved. The consideration of the television program as a visual communication medium art form that is analyzed, evaluated, and interpreted on the basis of its artistic or aesthetic merit is what genuine television criticism ought to be (Zettl, 1978). Therefore, we can presently talk about existing approaches to television criticism but we are not yet ready to talk about fully developed television criticism as we do in film and theater criticism. Well established as critical methods in literature, the arts, and more specifically in such visual communication media arts as theater and film, the reviewed critical approaches listed below and their application to the various television genres derive their origins from literary and art criticism and they are: (1) the Journalistic Approach, (2) the Sociological Approach, (3) the Historical Approach, (4) the Rhetorical Approach, (5) the Semiological Approach, (6) the Cultural Study Approach, (7) the Genre Approach, (8) the Producer's

Approach, (9) the Narrative Approach, (10) the Ideological Approach, (11) the Psychological Approach, and (12) the Visual Literacy Approach to visual communication media arts criticism.

The Journalistic Approach

This is the oldest approach to visual communication media arts criticism but it has found its wider application to television criticism as reviews, commentaries, reports, opinions, and short essays on various kinds of television programs. The major characteristics of the journalistic approach to visual communication media arts in general, and to television in particular, are as follows: (a) They are not traditional literary critiques but mostly subjective opinions, individual views, and personal comments of media writers; (b) They are tailored for and addressed to the mass readers of magazines and newspapers written mostly to entertain rather than to inform; (c) They are mostly concerned with the sociological issues of the program and seldom refer to the medium and its artistic potentials.

Examples of various kinds of journalistic approaches to television criticism can be found in such popular North American newspapers and magazines as *The New York Times*, *The Washington Post*, *The Saturday Review*, *The Los Angeles Times*, *The Globe and Mail*, *The New Yorker*, *TV Guide*, *Variety*, *Newsweek*, and *Time* magazines, to mention only those where known journalists write television critiques.

Although the overall contributions of journalists to the development of television as a unique medium turned out to be positive, antagonism and competition (mostly during the early years) of print media and electronic media hindered the development of television as an art form (Himmelstein, 1981). The journalistic approach to television criticism leaves out key elements of critical inquiry that are crucial for the development of television criticism as a responsible academic discourse.

A striking example of how journalistic writing does not meet the standards of critical inquiry is Morris Wolfe's (1985) book *Jolts: The TV Wasteland and the Canadian Oasis*. Wolfe (1985), a Canadian journalistic television critic, has attempted to analyze the content of American and Canadian television genres, across the board, resulting in a series of unsupported opinions strictly based on the social context of popular television programs of the two countries (Metallinos, 1991).

In their discussion of journalistic form of writing on television criticism, Vande Berg and Wenner (1991) suggest that: ". . . journalistic news, gossip, opinions, columns, and reviews of programs are not television criticism" (p. 18). Furthermore, they indicate that the features of journalistic writing such as audience, style, vocabulary, length, proofs, all fall short in their attempt to fully describe, evaluate, and interpret the television programs (Vande Berg & Wenner, 1991). The critical questions most typical to the journalistic approach to television criticism can be drawn from various areas of journalistic criticism which, according to Vande Berg and Wenner (1991) are: (a) personality or star gossip, mostly found in *TV Guide* and tabloids, (b) industry news updates commonly found in *Channels of Communication*, *Broadcasting Magazine*, *Videography*, *Video Systems*, (c) previews, mostly found in such popular magazines and newspapers as *TV Guide*, *The Soap Opera Digest*, *Variety*, *Time*, *Newsweek*, and (d) opinion essays, commonly found in *The New York Times*, *Channels of Communication*, *The New Yorker*.

Although the journalistic approach to visual communication media arts criticism is here to stay, its application does not substantially contribute toward the development of the media as art forms and particularly to "academic television criticism" (Vande Berg & Wenner, 1991, p. 23; Bywater & Sobchack, 1989).

The Historical Approach

The Historical Approach to visual communication media arts criticism is among the older approaches and centers on the historical events that caused the development of the particular visual communication media art forms. The bases of criticism of the arts are drawn from history, the discipline that studies systematically past events that effect nations, arts, and sciences. The various historical circumstances that help the art forms to be developed, along with the cultural institutions of the society, are the areas from which the standards for the evaluation of the historical approach to visual communication media arts are drawn.

From the existing literary sources that acknowledge the historical approach to visual communication media arts criticism, discuss its objectives, and underline its function, there are three that need to be cited here because each one gives a unique perspective to the historical approach to media criticism.

Bywater and Sobchack (1989) believe that the functions performed by the historical approach to film criticism, which can be extended to all visual communication media art forms, are to describe them in their historical context, to analyze them in terms of their aesthetic, economic, and social efforts, and to evaluate them in terms of their historical impact. These functions are most applicable to film, for which these authors suggest that:

> . . . the historical approach to film criticism is always marked by he context of history – both the general history of the world from the time the first films were made until now, and also the specific history of the movies as a business, as technological achievement, as artistic artifact. Those using a historical approach when assessing films attempt to understand how films have happened in time. (p. 139)

Scodari and Thorpe (1992) recognize the importance of the historical approach to visual communication media arts criticism, and suggest that this approach is closely related to social criticism because all historical events occur within a social context. They theorize that:

> The social/historical track is one that examines critical objects from the perspective of how they might contribute to the comprehension of ourselves and our society. In this instance, the critic might examine the changes or benchmarks that have occurred over a period of time – the historical events that can be documented as part of this network's culture, particularly as they might reflect the larger culture. (p. 18)

Vande Berg and Wenner (1991) acknowledge the importance of the historical approach to television criticism, discuss its various functions, and underline its domains. They maintain that:

> Historical criticism describes and analyzes television texts within their historical contexts. Historical analyses attempt to assess the roles that technological, economic, political, legal, regulatory, and aesthetic factors have played in the creation, reception, and impact of television texts in a particular society. Historical analyses, then, examine the intersection of producers, texts, and society. (p. 31)

From the comments provided by these three sources the following suggestions emerge: (a) There is an eminent and unavoidable connection between historical and sociological approaches to visual communication media arts criticism which makes the task of the art critic more demanding. (b) The relationship of the historical approach with that of the sociological is considered a limitation, rather than an advantage as some television scholars have also suggested (Cheserbo, 1987; Marc, 1984;

Williams, 1992, etc.). (c) This approach to visual communication media criticism is not only one of the older ones, it is also one of the most fundamental for the development of visual communication media arts criticism, and for their entire field of study.

The historical critics ask such historically oriented questions as: How have the generic, artistic, aesthetic, or even economic developments of a film or a television program changed over time? From the various television genres in existence, such programs as the *Civil War*, the *World at War*, are better suited to a critical inquiry of the historical approach. However, any popular television program (including children's television programs or cartoons) can be evaluated in terms of evolutionary changes (Williams, 1991).

The Sociological Approach

This approach to visual communication media arts criticism is among the older, most traditional, and widely used approaches. It derives its origin from the social sciences and arts criticism, which examine them through the framework of social relations and social functions. It centers on the various social issues, rules, relationships, and procedures contained in the film and television scripts and interprets the social effects of the programs on the viewer. In its broader adaptation and usage, the sociological approach to television criticism considers television programs, particularly the popular ones in prime time (such as situation comedies and detective stories), to be the catalysts of the socialization process and the ones that influence the social, occupational, economic, and a host of other types of behavioral occurrences of the individual viewers (Berger, 1982; McLuhan & Powers, 1989; McQuail, 1969; Sklar, 1980).

The sociological critics of the popular visual communication media arts of film and television draw their standards of criticism from the changes that take place in society and explain how institutions are effected by the programs. The sociological critics' concerns also lie in classes, status, and races. They examine the creation of stereotypes and lifestyles as the result of people's exposure to these media programs. It is the concern of the sociological critic of visual communication media arts to point out to what extent the arts express society's basic ideologies and the degree to which these art forms gratify the needs and wants of the citizens.

The sociological approach to visual communication media arts of film and television is a respected approach to criticism. It helps to predict the covert effects the program's content has on the viewers. It stimulates the creation of serious and effective public debates. This approach to criticism, however, is limited for the following reasons: (a) It centers its efforts primarily on issues that concern society and its institutions, stripping the content to its bare minimum by placing the emphasis on content factors rather than media related constructs. Undoubtedly, this helps the development of theories of mass communication media (DeFleur & Ball-Rokeach, 1975), but does not contribute directly toward the development of generic visual communication media arts criticism. (b) The role of the medium as an art form which shapes the mediated message is often left out of the sociological approach that is heavily content oriented. Critical studies in mass communication media suggest that this overemphasis on content and descriptive analyses of sociological issues in film and television programming has helped to maintain the tradition of *message* rather than a *medium* oriented critical analysis (Avery & Eason, 1991). (c) It down-plays the role of the visual communication media products as art forms with artistic merits and aesthetic potentials. Sociological critics are not interested in the development of the media products as art forms capable of expressing emotions and feelings. Rather, they see them as social signifiers and cultural commentary.

The critics of the sociological approach to visual communication media arts ask such questions as: What are the underlying sociological (and other) reasons that make a film or a television program so popular? What were the social influences of the program on its viewers? Such popular films as *Top Gun* and prime time television sitcoms as *The Bill Cosby Show* can be effectively analyzed and evaluated with the sociological approach to visual communication media arts criticism, among others.

The Rhetorical Approach

This approach to art criticism derives from the ancient Greek philosophers Protagoras and Aristotle who developed rhetoric as an art form in public speaking. Through the centuries it has been modified and reformed and has been used by many critics of the media arts including speech, storytelling, film, and television (Rybacki & Rybacki, 1991). It is the most conventional of art criticism and the most descriptive because it draws its standards from such traditional rhetorical schemata, or techniques of persuasion, as *ethos* (or ethical consideration), *pathos* (or truthfulness of the argumentation), and *logos* (or narrative standards), regardless of the art and the medium that carries it. The rhetorical approach considers all the protagonists involved in the acts of creating, transforming, and responding to the art such as the *sender*, the *medium*, and the *audience*.

The wide application of the rhetorical approach to visual communication media arts criticism, and primarily to television programs, is rather recent and it comes from the works of speech communication and media scholars starting with Kenneth Burke (1950) and Karlyn Campbell (1972) and continued with the works of Foss (1989), Medhurst and Benson (1984), Smith (1980), Farrell (1989), etc. Critical studies that examine how media messages are structured to influence audiences belong to the rhetorical critical approach. The persuasive role of the mediated event is another major concern of this approach to criticism, and it is for this reason that the critics look for those particular aspects of the program that exert the greatest persuasive power on their audiences.

As all network television commercials indicate, their ultimate success is due to their excessive use and persuasive techniques. Application, therefore, of this approach to television criticism is very useful as it identifies the hidden intentions (the persuasive objectives) of the program. A rhetorical analysis of a television documentary, for example, might reveal the persuasive, subjective, and biased intentions of the producers that, otherwise, will pass unnoticed.

The rhetorical approach to visual communication media arts criticism is both useful and effective for the following reasons: (a) It draws its criteria for the analysis, evaluation, and interpretation of media programs from the structural analysis of their texts, and from the ways by which the visual media mediate and present the events, the messages. (b) It is applicable to all visual communication media art forms, and primarily embraces all television program formats from commercials to documentaries. (c) More than any other critical approach, the rhetorical comes close to an academic critical discourse, recognized and accepted by all scholars seriously concerned with the development of visual communication media arts criticism in general, and television in particular (Rybacki & Rybacki, 1991).

The critics of the rhetorical approach ask such questions as: What persuasive means were used in the science series *Cosmos*? In what ways have the texts' structures of the films *The Third Man* or *Citizen Kane* influenced their spectators? Evidently, this approach to criticism can be applied to a variety of visual communication media products such as music shows (Morse, 1991), political debates (Mumby & Spitzak, 1991), and game shows (Williams & Rigby, 1991).

The Narrative Approach

The origins of the narrative approach to art criticism are found in Aristotle's *Poetics* in which the three known forms of poetry—epic, dramatic, and lyric—are reviewed and the main differences between epic and dramatic narrations (or plots) are examined (Fergusson, 1961). It has maintained its presence in literature and art criticism, mostly under the auspices of rhetorical criticism and has arrived in its present form, revitalized, defined, and acknowledged as a unique approach to visual communication media art products by such proponents as Fisher (1987), Chatman (1978), Deming (1985), Lewis (1987), Smith (1988), and Martin (1986), all of whom acknowledge its rightful application in visual communication media arts forms, particularly in film and television.

The central concern of the narrative approach to visual communication media arts criticism is the analysis, evaluation, and interpretation of the story of the programs as it is narrated by the text, visuals, and sounds. Since the various narrative elements that constitute the program's storytelling can be drawn from myths, social situations, political figures, dramatic heroes, and a plethora of other circumstances, this approach to criticism is collectively called narrative to incorporate such other critical approaches found in the literature of criticism as mythical method (Vande Berg & Wenner, 1991, p. 32), dramatistic criticism, and aesthetic criticism (Scodari & Thorpe, 1992).

The goals of the narrative approach to criticism are to reaffirm the existing ideas and images and to revitalize, reinforce, and purify them (Fisher, 1987). Being a byproduct of the rhetorical approach, the narrative approach to visual communication media arts criticism uses the rhetorical structure of discourse and storytelling to evaluate the media product. It looks at the ways the story is told and examines the characters involved in the action, the setting in which the action occurred, the signs used, the archetypal models of the society and a host of other similar elements from which the standards for analysis are drawn.

According to Vande Berg and Wenner (1991), the critics of the narrative approach, to extract the appropriate standards for their evaluations, ask these questions:

> What world view – cultural or archetypal models of social identity, values, actions, and structuring – is affirmed, in the narrative? What abstract ideas, values, roles, and beliefs are presented as good or evil, heroic or villainous, or natural or unnatural in this narrative? What other opposing characters, settings, and actions are present? In what other environment or past forms has this story been presented? (p. 32)

Like its predecessor, rhetoric, the narrative approach to visual communication media products applies to almost all genres of film and television programs. However, its overemphasis on the textual analysis of the program, its general look at the television program's plot, character, and symbolism, and the perpetual absence of any meaningful discussion of the production elements of the programs, are some of the major drawbacks of this approach to criticism as it is used today by television analysts.

The Cultural Approach

Developed as a means to explain the impact of visual communication media products in creating popular culture, the cultural approach to criticism examines the creation and distribution of meaning in contemporary society. The critics of this approach draw the standards for the evaluations on the observed trends and movements such as the civil rights, anti-nuclear, and environmental issues found in such mass communication media as film, television, music books, magazines, and newspapers. And, among its founders and proponents are Allen (1987), Carey (1988), Davies, Farrell, and Mathews

(1982), Fiskie (1987), Hall (1982), Rybacki & Rybacki (1991), and Steward, Smith, and Denton (1984).

There is a general agreement among the proponents of the cultural approach to media arts criticism that it is widely spread, covers several other disciplines and areas of study, and that this approach is most applicable to film and television programs of all genres. For example, Scodari and Thorpe (1992) generally agree on the wide application of the cultural studies approach to media criticism and on its wide spread to other disciplines and explain that:

> Cultural studies is a broad framework for interpreted research with roots in fields such as anthropology and literature [Carey; Fiskie; Hall]. It considers all types of discourse, artifacts, myths, and rituals as texts, through which a shared culture is created, modified, and transformed [Carey, 41-43]. (p. 48)

So do Vande Berg and Wenner (1991) who point out the numerous other areas covered under the broader umbrella of cultural approach to media criticism and state that:

> This approach assumes that ideology, economic structures, and culture are inseparable. This critical perspective is rooted in a combination of neo-Marxist political-economic theory, structuralism and semiotics, and Freudian psychoanalytical theory. This approach examines class, race, and gender issues in television programs by invoking ideology, hegemony, and discourse as central critical constructs. (p. 27)

The wide range and application of this critical approach to visual communication media arts of all genres is also confirmed by Rybacki and Rybacki (1991) who argue that:

> Cultural approaches to criticism are most organic methods of communication criticism because they do not depend on a single theory base. Because there are so many possibilities for doing cultural criticism, no single approach can be identified as the cultural approach. (p. 132)

It is, therefore, evident that this approach to criticism is one of the most appropriate and most applicable to the visual communication media arts. It gathers evaluative judgments from a variety of academic disciplines, theories, and cultural movements that strengthen the analysis. It covers a vast number of issues (e.g., political, economic, social, ideological, and cultural) found in all film and television genres today. Finally, this approach to criticism considers equally the significance of the message and the importance of the medium in shaping the message, a concept based on McLuhan's (1964) thesis that the medium is the message, and establishes that the cultural studies approach is most appropriate and most applicable to visual communication media arts criticism.

The cultural studies critic challenges the socio-cultural, political, and other such movements, and asks such questions as: What are the various ideological forces that produced these movements? How does the movement (such as the civil rights, feminism, or neo-nazism) influence the viewers? How do the media techniques employed assist in delivering the message? Examples of the application of this approach to film and television criticism are found in narrative films such as *Saturday Night Fever* (Bywater & Sobchack, 1989) and in television such as *The Late Night Talk Shows* (Buxton, 1991), and *TV Quiz Shows* (Fiskie, 1991).

The Semiological Approach

The basic premise of the semiological approach to visual communication media arts criticism is that the more we understand the signs system of our culture the more readily we perceive their meaning in society. It originates in semiotics, the scientific study of signs and examines how the laws and conditions under which signs and symbols (including words) assume their meaning. It is purely a scientific approach to visual communication media arts criticism because its main concern is the development of knowledge about language to increase its influences in scientific as well as artistic works. Since all art forms are symbolic, the semiological approach to visual communication media arts criticism is fundamental for the development of criticism of the particular visual communication media arts.

Developed first in film studies as a language of cinema (Metz, 1974), the semiological approach to visual communication media arts criticism looks at the ways by which the programs' texts (the scripts) are created (Silverman, 1983). It examines the program's structure and discusses its effectiveness, or shortcomings, to communicate the intended meanings. The standards, therefore, for this approach to criticism are the codes, metaphors, signs, and the syntagmatic structures of the programs, all of which derive their origins from the academic discourses known as structuralism and semiotics. The symbolic representation of meaning inherent in the film or television pictures is analyzed by the semiological approach which Vande Berg and Wenner (1991) classify as metacritical approaches due to its dual origin from structuralism and semiotics.

Although its application in film studies and criticism is both extensive and effective, when it is tried by television critics the semiological approach turns out to be limited and ineffective for the following reasons: (a) The development of the fictional film scripts exceeds, by far, the development of fictional television scripts. Therefore, the creation of the language or text of the commonly found television programs can not be readily achieved by a semiotic analysis which requires well written, carefully thought-out, and linguistically structured scripts. (b) The lack of conventional iconic, indexical, and symbolic signs--in the vast land of television programming--does not, as yet, permit the use of semiotics to evaluate them, as it is easily possible with the conventional and well established signs and codes of the medium of film. (c) The across the board low quality of television programs, particularly network television programs, destined to entertain the masses, do not warrant, at this time, evaluation standards as complex, scientific, and sophisticated as those proposed by the semiological approach. An indication, perhaps, that television has matured as an art form, will be when such an approach is widely adopted and commonly used by television critics.

The visual communication media arts critics who use the semiological approach developed their argumentation on such questions as What is the ideology behind the use of black and white, instead of color, in this film, or television program? What is the basic cinematic, or television language of the particular film or television program, and how does it work? Among the various film and television genres most suitable to a semiological criticism could be Fellini's film *Amarcord* or the television program *Thirtysomething* (Porter, 1991).

The Psychological Approach

The psychological impact of the arts on individuals and their institutions was first pointed out by Plato in *The Republic* and Aristotle in *The Poetics*; later on it was established by the father of psychology and the founder of psychoanalysis Sigmund Freud (1856-1939) and it continued with Freud's pupils and followers, Carl Jung (1875-1961), Alfred Adler (1870-1937), Otto Rank (1884-1939), and Abraham Maslow (1954), to mention only those directly related to the present discussion. The powerful impact of the arts on individuals and society alarmed, early on, the philosophers and the thinkers of the western world who generated the ethical and the aesthetic approaches to art criticism.

Stemming from the behavioral sciences, the psychological approach to visual communication media arts criticism assumes different forms such as *psychoanalysis* (concerned with the emotional state of the individual), *social psychology* (concerning the relationship of the individual with society), the *Maslowean or motivational psychology* (that centers on the basic human needs, wants, and desires the arts fulfill in various degrees), and the *Jungian psychoanalysis*, (which equates films as dreams), *perceptual psychology* (which refers to receiving and organizing sensory data), *cognitive psychology* (which refers to the de codification of perceived data). The basic factors that concern all forms of psychological approach to visual communication media arts criticism are emotions, feelings, learning abilities, perception, motivation, cognition, needs and desires, memory, thinking, intuition, and sensation. These, and a great number of other similar factors constitute both the constructs upon which the various psychological theories are built, and the standards for the evaluation of the visual communication media arts criticism.

In the case of film and television criticism, the critics of the psychological approach focus their attention on the program's effects on their viewers caused by such additional psychological factors as persuasion, change of attitude, morality, and artistic appeal. Since any of these factors can be found in almost all film and television genres, the psychological critics rely on the behavior, the attitudes, and the actions of the characters to develop the arguments for their analyses. Consequently, those programs that have strong characters, well structured plots, with emphasis on the emotional involvement of the viewers, are more suitable to psychological approach to visual communication media arts criticism. For example, films like *Citizen Kane* by Orson Wells and *Psycho* by Alfred Hitchcock, or television programs like *Magnum, P.I.* (Flitterman, 1985 and *LA Law* (Parry-Giles & Trandt, 1991) are better analyzed by the psychological approach to criticism. The questions the critics of this approach ask are: What motivated the unusual behavior of the protagonist of the film? How do the personalities of the characters in the television programs contribute towards their popularity and consequently their economic success?

Whereas the psychological approach to art criticism is one of the oldest and it is widely used in film criticism, this approach is only sporadically used in television program analyses. One would have expected, for example, that the so-called Jungian psychological analysis (successfully adopted by film) which, according to Rybacki & Rybacki (1991): "...offers a system for analyzing and evaluating the way a succession of images involve an audience and draw perceptual, effective, and cognitive responses from them" (p. 139), would have been also adopted by television analysts who are cognizant of the approach and its effective application to film. Some explanations for the delay of the wider application of this approach to criticism by television critics are: (a) the lack of specific knowledge of the field of psychology and psychological criticism, by the present critics of television programming, (b) the Freudian psychoanalysis of the unidimensional, and often shallow, characters of the great majority of regular television programs such as soap operas, situation comedies, dramas, etc., do not appeal to television analysts who seem to be preoccupied with the role of the medium as an institution in a mass society, rather than its potentials as an art form, (c) the behavioral schools of thought that have been embraced by visual communication media arts criticism, such as the Freudian, the Jungian, the Maslowean, and such additional approaches to criticism as semiological, dramatic, cultural, aesthetic, etc., are all closely related to the psychological approach. Consequently, they confuse rather than assist and hinder rather than contribute towards the development of an autonomous psychological approach to television criticism.

The Ideological Approach

The Ideological Approach to visual communication media arts criticism is a rather recent approach adopted by media critics who analyze the visual communication media products, film and television programs on the bases of their philosophical, anthropological, political, economic, sociological contexts or ideologies. Since the contents of the various film and television genres are numerous and diversified, the ideological approach to criticism seems to be serving all sorts of film and television programs, a task that is demanding and therefore not always successfully performed.

Built on the ideology inherent in the visual media program's texts, this approach draws its standards to perform its critical task from a variety of issues such as (a) neo-Marxist's ideology (with emphasis on hegemony of media in society), (b) hermeneutic ideology (with emphasis on exegesis, or interpretation of the issues in the programs' texts), (c) structuralistic ideology (which concerns itself with the anthropological and philosophical codes inherent in the film or television programs), (d) gender ideology (which deals with the treatment of gender mostly in feminist programs), (e) dialogic ideology (which refers to the dialogic conflict that exist in the text of the program), and (f) discourse ideology (which refers to the social and ideological dimensions of the language of the texts), (Vande Berg & Wenner, 1991).

Some scholars believe that the ideological approach to visual communication media arts criticism is purely theoretical. It is a modernistic critical strategy that founds its application in such additional discourses as semiology, structuralism, Marxism, feminism, and neo-Freudism. When used by film critics, the ideological approach's functions are to "Describe and analyze film's properties; attempt to find the essential aspects of the medium and its relation to culture; seek answer to the basic question: What is Cinema?" (Bywater & Sobchack, p. 162). When used by media critics, the ideological approach to criticism, according to Rybacki and Rybacki (1991), "...emphasizes the truth standard of evaluation, judging rhetorical acts by a definition of truth that is derived from the tenets of a particular ideology" (p. 148). These two concepts alone confirm how diversified, multi-leveled, and, therefore, demanding, this approach is.

Although the literary sources on media criticism consider each of the ideologies mentioned above to constitute a unique critical methodology, the very nature of this approach suggests that this is an ambition on the part of these scholars that cannot be documented. The shortcomings of the ideological approach to visual communication media arts criticism are as follows: (a) It is subjective and biased in its practice because: "Ideological critics tend to assume that the truth has been revealed to them, and they may become disciples of this truth" (Rybacki & Rybacki, 1991, p. 149). (b) These various ideologies are readily applicable to literacy and to art criticism, including film, but cannot apply successfully to television programs--particularly to commercial television programming--since the texts are lacking the depth stemming from such ideologies and issues. (c) None of the above ideologies concern themselves with the production aspects, the artistic conventions, and the aesthetic merits of the particular television program which needs such analysis the most.

The critical questions asked by the ideological approach to visual communication media arts are, for example: How have the historical, political, social, feminist, and other movements influenced the culture, the media, and their subsequent programming? Examples of film and television genres mostly suitable to ideological criticism are such politically oriented movies as *Lawrence of Arabia*, and *Dr. Zhivago*, and television programs such as *Abraham Lincoln* and the *Civil War*.

The Genre Approach

The successful development of scientific theories in film studies owe a great deal to the genre approach constructs upon which film theories were built. The same is true of the development of the arts and literature. Consequently, television studies can gain considerably from the application of the genre approach to criticism that is one of the best suited approaches for the analysis of the medium.

The genre approach to visual communication media arts criticism is defined as the inquiry, analysis, and interpretation of film and television programs whose formats bare the same similarities, have the same central characteristic, assume the same purposes and objectives. The evaluative standards formed for the analysis and interpretation of various film and television genres are derived from the structural similarities found in each format, from the comparisons of the program's texts, and, generally, from the identification of the common elements of each program such as the westerns, science fiction, adventure movies, soap operas, children's programs, situation comedies, action, horror, and drama programs.

The advantages offered by this approach to television criticism in general, and to television studies in particular, are as follows: (a) Categorizing and classifying the great variety of television programs that are created and broadcasted yearly, helps the television genre critic to look more closely at the shared conventions of the programs which often are indicators of trends, movements, changes, that take place in society. (b) Searching for commonalities among television programs the genre approach critic provides valuable information on the motives, beliefs, and objectives of the industry and the producer and/or director who created the program. (c) This approach to visual communication media criticism is intertextual in its nature. Its analysis of one text is often based on and it makes reference to another. When it applies to television programs it offers reliable, and much needed, information on the scripts as a production variable of the television medium.

The critical questions in the film and television programs most suitable to the genre approach to criticism are: How do the John Wayne westerns differ from those of Clint Eastwood? What do such adventure television programs as *Moonlighting* have in common with such action programs as *Miami Vice*?

The Producer's Approach

This approach to visual communication media arts criticism is firmly established, developed, and recognized in film studies and criticism known as the auteurist approach. It is based on the fact that major film directors such as Alfred Hitchcock, Orson Wells, Frederico Fellini, and Ingmar Bergman have created a series of films that bear the signature of the director's unique approach and artistry. It is closely related to the genre approach in that the same authors and/or directors have produced films with similar themes and characteristics like Hitchcock's mystery film or John P. Ford's westerns.

This approach to criticism is applicable to television where we find common in theme and character programs produced or created by persons who impose their own style such as Norman Lear's and James Brook's *spin-offs* in situation comedies (Newcomb & Alley, 1983), or the producers of the law and courtroom series in American network television programming. This approach not only is applicable, but it is one of the most successful and widely used by today's television commentators, reviewers, and analysts.

Bywater and Sobchack (1989) suggest that the ultimate functions of the author, producer, and/or director approach to film criticism are to: "Identify the person most responsible for the creation of the film, usually the director; describe and evaluate the work in terms of uniqueness or consistency, style, or excellence of craftsmanship. . ." (p. 51). By doing so, the critics provide invaluable information about the film's objectives and artistry. Concerning the purpose of the producer's approach to television criticism, Vande Berg and Wenner (1991) believe that this approach goes beyond the semantic and syntactic analysis of the similarities of the texts of the television genre--a task performed by the genre approach of television criticism. It extends its purpose to "...identify the formal stylistic and thematic signature of a single creator artist – the director, the producer, the writer, the writer-producer" (p. 31). This, however, suggests that the producer's approach to media criticism must look for such additional traits as personality, political ideology, social involvement, artistic competencies, and educational background of the producer of the program. This task is demanding and few visual communication media analysts are willing to undertake it, particularly today's television analysts, journalists and reporters of events who write, mainly to impress and entertain their readers.

The application of the producer's approach to film and television criticism has major advantages over the other approaches discussed so far and offers a great service towards the development of film and television studies, some of which are the following: (a) It provides what Bywater and Sobchack (1989) call: ". . .a major source of insight into a large group of single artist's creative production" (p. 77). This collection of information has the advantage that it centralizes information and makes it accessible for further film and television studies. (b) The producers and/or authors of the media products critical approach is paradigmatic or exemplary in that it exposes the various traits, the good and the bad ones, of the producer, something that brings closer the product, as an art form, with its producer, as an artist. (c) It provides standards for the analysis of the program, which are drawn heavily from production variables such as producer's and/or director's style and techniques of lighting, shooting or framing style, usage of sounds, and editing. These variables, then, easily become the constructs of film and television production theories.

The critics of the producer's approach to visual communication media arts criticism ask these basic questions: What are the unique traits of the producer of the film *La Dolce Vita* or the television program *All in the Family*? Does the producer and/or director usually favor certain lighting, framing, editing, or audio techniques unconventional to other producers and/or directors? Examples of film and network television programs that are most suitable for the producer's approach to visual communication media arts criticism are the films *The Birds* and *Psycho* (Alfred Hitchcock) and the television programs *The Mary Tyler Moore Show* and *Rhoda* (created by James Brooks).

The Visual Literacy Approach

The Visual Literacy approach to film and television criticism has its origins in such traditional approaches to criticism as humanistic aesthetics (Bywater & Sobchack, 1989), visual arts aesthetics (Arnheim, 1969; Dondis, 1973), and media arts aesthetics (D'Agostino, 1985; Zettl, 1990). It examines the principles governing the visual communication media arts such as film and television programs and deals, primarily, with the development of a language--and consequently the building of a body of literature--with which individuals can communicate and discuss signs, symbols, images, pictures with sounds and motion, etc. (Debes & Williams, 1978, 1970; Dondis, 1973). Individuals who learn to read and understand visual images, who are able to communicate with visual images, or those who have developed the ability to search for and evaluate visual information in media arts products, are considered visually literate.

The visual communication media arts critics draw their value judgments from a variety of visual literacy related constructs. The most prominent among them are light and color, depth and size, framing, focusing, zooming, dissolving, cutting, editing, sounds, and motion rate of visual elements (Baggaley, Ferguson, & Brooks, 1980; D'Agostino, 1985; Metallinos, 1973, 1985; Zettl, 1978).

The heavy emphasis on (a) the synthesis of visual images, (b) the detailed analysis of the visual image's production techniques, and (c) the consideration of the perceptual, cognitive, and aesthetic variables involved in the study of film and television media, all constitute the main characteristics of the visual literacy approach to media criticism. This approach brings the critique closer to what we have termed the *vertical approach*, most appropriate and most desirable for the analysis of visual communication media arts rather than the commonly practiced, in existence today, journalistic approach that we have termed the *horizontal approach* to film and television media, most inappropriate for the study of visual communication media arts, and particularly television.

The analysts of the visual literacy approach to film and television criticism ask questions that cover all the areas of concern such as the *message* or content, the *medium* or form, and the *audience* or message's reception and impact upon its receivers. For example, in the film by Fellini, *8 1/2*, or in Hitchcock's *Psycho*, the visual literacy critic will ask: In what ways did the filming techniques of these shows enhance the viewers suspense and increase their attention? Whereas in the television programs *L.A. Law* and *Law and Order*, the most suitable question would be: How did the construction of the set, assist the videotaping of these programs and create their faithful and realistic courtroom atmosphere?

The advantages of this approach are obvious, and the contribution to the development of suitable theories of the study of television criticism and aesthetics are warranted, as it is attested to by the films critics that employ this approach (Bywater & Sobchack, 1989).

Summary and Conclusions

The first part of this paper reviewed the literary sources referring to visual communication media arts criticism and underlined the standards for the evaluation of the visual communication art form mostly produced by film and television. The second part introduced, discussed, and exemplified the various approaches to visual communication media arts criticism, particularly television, such as the journalistic, the sociological, the historical, the rhetorical, the semiological, the cultural, the genre, the producer's, the narrative, the ideological, the psychological, and the visual literacy. From the proceeding discussions the following general conclusions are drawn:

1. The lack of genuine critical methodologies in visual communication media arts--particularly television--is a strong indication of the absence of scientific theories that govern the rapidly emerging new visual communication media products, such as computerized television, holographic, three-dimensional, high definition television images, and multimedia. (Metallinos, 1990a, 1990b, 1987).

2. This gap can be narrowed by the creation of academically accepted critical approaches to the above visual communication media forms. Such approaches should stem from well developed fields of study as indicated in the discussion of the approaches above, and they should be the common practice in television critical analyses.

3. Although the orthodox procedure in the development of art criticism is to base the analysis on existing theories, the establishment of critical standards for the evaluation of the newly emerged visual

communication media art products could result in the formation of constructs on which these theories could be built. An approach, rather than a method, seems to be a more appropriate procedure to follow to achieve this goal.

A more rigorous, systematic, and selective application of the appropriate approach to visual communication media criticism, to the suitable media products, warrants the development of visual communication media programs in general and television in particular, as genuine artistic forms.

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Thinking Egyptian: Active Models for Understanding Spatial Representation

Ellen Schiferl

One goal of multiculturalism in education is increased understanding and art history, an inherently multicultural discipline, has pursued this target in two major ways: (a) Inclusion: expanding the canon to include more women, minorities and non-Western cultures, (b) Contextualization: discussing cultures according to their value systems rather than by the standards of our culture. To achieve a more multicultural outlook, introductory textbooks have partially revised their texts to address issues of race, class and gender. However, cultural bias in spatial representation has been generally overlooked despite the centrality of spatial concepts for understanding art. Studies of Egyptian art clearly reflect this problem. Three major art history survey textbooks continually measure Egyptian art according to a narrowly defined "realism" that echoes contemporary definitions of reality while explaining the "strangeness" of Egyptian art in terms of religious beliefs. This paper first highlights how introductory textbook chapters on Egyptian art inhibit understanding by reinforcing student preconceptions and second demonstrates another approach to discussing space with classroom exercises and software. This study does not aim to eradicate bias, an impossible quest in a discipline dependent on comparative techniques, but to present active visualization models that expand student understanding of different approaches to spatial representation.

Textbook Evaluations of Egyptian Art

Old and new, evolutionary and contextual, approaches blend uncomfortably in recent art history textbooks. Traditionally, scholars evaluated art according to concepts of the visible world developed in ancient Greece and post-medieval Europe. Pejorative evaluations, like "decidedly primitive," may not survive the next edition of Janson's *History of Art*, but more subtle descriptive language often reinforces the familiar at the expense of the foreign (Janson, 55). The three major textbooks, *Gardner's Art Through the Ages* (authored by H. De la Croix, R. G. Tansey and D. Kirkpatrick), F. Hartt's *Art. A History of Painting, Sculpture. Architecture*, and A. Janson's *History of Art*, compare Egyptian art, usually unfavorably, to a "realistic" art shaped by contemporary scientific methods and technology. To communicate the nature of Egyptian art, the authors focus on its differences and limitations compared to popular 20th century approaches and consequently present 20th century methods as the standard.

Realism defined as impersonal observation of the physical environment. Like scientists who strive for objective observation, artists who carefully observe the visible environment with detachment and detail are praised for accuracy and realism. Both *Gardner's Art Through the*

Ages and Janson applaud the Egyptian artists who depart from the standard Egyptian style reserved for important figures.

> *The outsize and ideal proportions bespeak Ti's rank, as does the conventional pose, which contrasts with the realistically rendered activity of his diminutive servants and with the precisely observed figures of the birds and animals among the papyrus buds.*
>
> *Although the water and the figures are represented by the usual conventions, cat, fish, and birds show a naturalism based on visual perception similar to what we see in the Geese of Medum. (De La Croix, 86, 95)*
>
> *...these scenes form a seasonal cycle, a sort of perpetual calendar of recurrent human activities for the spirit of the deceased to watch year in and year out. For the artist, on the other hand, these scenes offered a welcome opportunity to widen his power of observations, so that in details we often find astounding bits of realism. (Janson, 63)*

Such statements validate students who assume that good art represents the external surfaces of objects and "detailed" images are superior to "simple" ones. For both textbooks and students, realism defined by observation becomes the gauge of accuracy and truth.

> *A Canon of ideal proportions, designated as appropriate for the representation of imposing majesty, was accepted and applied quite independently of optical fact...The Egyptian sculptor seems to have been indifferent to realistic representation of the body, preferring to strive for fidelity to nature in the art of portraiture. (De La Croix, 85)*

For Hartt, the observation of nature found outside the standard approach to imagemaking is one of the major contributions of Egyptian art to subsequent cultures.

> *...the road that Egyptian artists, despite the severe conventions within which they were obliged to work, opened up for the understanding of nature and its re-creation in visible form was the one soon to be followed by every ancient civilization.* (Hartt, 101)

The focus on clear and complete information that stimulated Egyptian art and continues in many subsequent cultures including ancient Greece, the Middle Ages, as well as contemporary graphic design and videos, is not recognized as an enduring accomplishment. Rather the dominant method of representation is perceived as a restrictive convention while detailed observation is regarded as a sign of independence from cultural constraints.

The Camera Defines Realistic Representation. In the introductory chapter of *Art Through the Ages*, the authors strive to avoid negative comparisons between cultures, but then use a machine as the ultimate measure of realism.

> *...nor is it the case that artists of one period "see" more "correctly" and render more "skillfully" than those of another. Rather, it seems that artists represent what they conceive to be real, not what they perceive. They bring to the making of images conceptions that have been instilled in them by their cultures. They understand the visible world in certain unconscious, culturally agreed on ways and thus bring to the artistic process ideas and meanings out of common stock. They record not so much what they see as what they know or mean. Even in the period of dominant realism in recent western European art, great*

> *deviations from camera realism have set in.* (De La Croix, 18-19, see also Hartt, 18)

Like the textbook, many entering students describe accurate representation with the phrase "as realistic as a photograph" without careful consideration of the limitations of the photographic medium.

20th century Comparisons Focus on the Limits of Egyptian art. Introductory texts reinforce negative evaluations by comparing Egyptian style to images presumably so familiar to students that a specific comparative example is not necessary.

> *Obviously, the modern notion of representing a scene as it would appear to a single observer at a single moment is as alien to the Egyptian artist as it had been to his Neolithic predecessor; he strives for clarity, not illusion, and therefore he picks the most telling view in each case. But he imposes a strict rule on himself: when he changes his angle of vision, he must do so by 90 degrees, as if he were sighting along the edges of a cube. As a consequence, he acknowledges only three possible views: full face, strict profile, and vertically from above. Any intermediate position embarrasses him (note the oddly rubber-like figures of the fallen enemies...)... And since the scenes depict solemn and, as it were, timeless rituals, our artist did not have to concern himself with the fact that this method of representing the human body made almost any kind of movement or action practically impossible. In fact, the frozen quality of that image would seem especially suited to the divine nature of the Pharaoh; ordinary mortals* act, *he simply is...The Egyptian style of representing the human figure, then seems to have been created specifically for the purpose of conveying in visual form the majesty of the divine king...* (Janson, 57)

The author uncritically presents the Renaissance approach using a single observer, single moment and single eye as the modern benchmark for comparisons. As noted above, this approach accords with scientific procedures and camera photography.

Beyond Verbal Descriptors: The persistence of negative evaluations of Egyptian art based on contemporary comparisons is surprising since art historians for over a decade have relied heavily on contextual studies to interpret art according to the values of the societies that produced it. The contextual approach developed as a counterweight to the linear evolutionary model that hailed the rise of new techniques, such as foreshortening and linear perspective, as an improvement over previous methods. Yet in spite of efforts to judge cultures according to their own values rather than by the standards of our own culture, the scientific and technological bias still pervades discussions of other cultures.

Arguably, cultural bias cannot be eradicated from discussions of other cultures, and despite efforts to cleanse texts of verbal bias in race, class and gender, bias can be found wherever comparative language and qualitative assessments appear. The term "realism" has always been problematic but even phrases like "keen observation" reflect cultural bias. Rather than call for more textual revision, the goal of art historians as educators can shift from descriptive language to image-based methods of teaching art history.

Active Models for Spatial Representation

For art history, visual methods should be the center, rather than the periphery, of communication. Computer and video technologies allow instructors to transfer the visual techniques used in the classroom to durable media. Thus the instructor's hand tracing the movement of the viewer's eye over a projected slide becomes an animated diagram overlaying a digitized image and the chalkboard drawing illustrating the steps leading to the final work becomes a video for students to review at their leisure. This paper relies on examples from classroom techniques and software I developed by adapting classroom approaches to multimedia computer applications.

The approach used for studying Egyptian art can be extended to the study of many other cultures by focusing on similar basic questions. Following the contextual approach, the content focuses on understanding art through its function: What is the purpose of art in the culture? What is it and how is it used? How does the work reflect cultural concepts and priorities? How well does the form fit the concepts?

The approach differs from the textbooks by:

(1) Establishing connections first. Textbooks lead with comparisons that reinforce differences. When students can connect their patterns of thought to Egyptian artists, they find the art easier to comprehend.

(2) Inviting student participation in other methods of thinking. Students participate in the decision making process. By recognizing the visual logic of Egyptian art, they can more readily understand Egyptian art on its own terms.

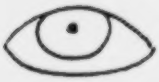
(3) Concluding with a comparison that reveals the limitations of a contemporary approach. Comparisons to contemporary styles effectively show differences in visual thinking but when textbooks begin with these comparisons, they establish 20th century approaches as the standard. Textbooks further reinforce this bias by noting the limitations of Egyptian style. Since so many entering introductory art history students consider Egyptian art limited and unrealistic, the third section of the software counterbalances these ideas by showing the limitations of a contemporary painting employing the same subject matter as an Egyptian example.

Classroom Exercise: Eye and Hand

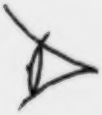
Prelude and Timing. This exercise follows general discussion of Egyptian religious concepts and values relative to geography and pyramid architecture. Almost all surviving Egyptian art stems from tombs and was designed to ensure that life after death would continue the activities and pleasures of earthly life. To avoid the pitfall of an exercise where students try to produce what they think the instructor expects, do the exercise before students see any sculpted or painted images of Egyptian art in class or have been given much information about Egyptian religion.

Eye exercise. Ask each student to draw one human eye. While they are drawing, note whether any student looks at another person's eye. When students have had a few minutes to complete their drawing, draw a frontal eye on the blackboard. Ask students to raise their hand if they drew a frontal eye, with or without eyelashes, pupils, eyebrows, etc. Draw a profile and three-quarter view eye and repeat the question. Then ask if they looked at another person to help them draw an eye.

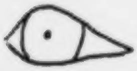
Observation. In dozens of classes and with hundreds of students, I have had only one student who did not draw a frontal eye. And no student ever looked at another person's eye to aid their drawing. (100% of the session attendees at the Tempe IVLA conference produced a frontal eye.)



Frontal Eye



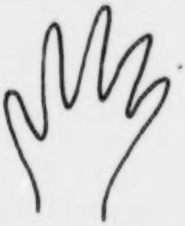
Profile



Three-quarter

Hand exercise. Repeat the exercise by asking students to draw one human hand. Ask how many did an open hand with thumb and all five fingers (palm up or down). Consider the variety of other options for hand positions.

Observation. In a class of thirty students, I typically have two or three who did another hand position. A very small percentage of students will study their hands before drawing.



Discussion: Why do so many students do a frontal eye? Why did so few look at a hand prior to drawing? What does this tell us about the way our minds process images? Students respond that the frontal eye contains the most complete information, an approach art historians sometimes call the most characteristic aspect, most characteristic view, or conceptual approach.

Develop the concept of most clear and complete information by showing an Egyptian painting of an important person. Ask which viewpoint would provide the most complete information for eye, shoulders, legs, and feet. Note the mixture of frontal and profile selections (figure 1).

Why do the Egyptians produce images based on the most complete information? In Egypt, artists played a vital role by ensuring the afterlife of the pharaoh and the royal elite. Paintings in tombs *became* not just represented, the object in the next life and thus artists exercised care to assure the most viable form.

Raise the question of the most complete information for the face next since this leads to more complex discussion. Most students select a frontal face while the Egyptians chose a profile. One reason the Egyptians select the profile view is the clear representation of the nose; in North America many professional portrait photographers virtually eliminate noses in frontal and three-quarter view faces through strategic lighting and photographic retouching (magazine covers provide excellent examples). Since Egyptian images ensured the life of forms after death, presumably the Egyptians considered the function of the nose -- breathing -- vital for afterlife; magazine ads regard noses as relatively unaesthetic and a distraction from other features.

Optional Discussion. Can you think of ways that our society uses the most complete information approach to communicate visual information? Possibilities include the signs for bicycle paths, representations of men and women for restrooms, images of wheelchairs to show access and reserved parking, and the trashcans on computer interfaces.

Summation. Egyptian artists created tomb images to *be*, not to be seen. As a creation rather than a representation, the art needed to be as clear and complete as possible. For the Egyptian artist, the religious function determined the form.

Software: Thinking Egyptian

Thinking Egyptian, interactive multimedia software, uses animations, interactive responses, and problem solving approaches to involve the user in the visual logic of Egyptian art.

Visual Logic of Construction. The key to art is selection. Why does the artist make certain choices? In *Thinking Egyptian*, users participate in a step by step decision making process to re-create an Egyptian painting featuring a rectangular pool surrounded by trees and stocked with fish and ducks (fig. 2). For the individual components of fish, ducks, and rectangular pool, the users choose which viewpoint communicates the clearest and most complete information and then compare their answer with the Egyptian approach. Typically users make the same selections that Egyptians made and thus connect their way of thinking with the Egyptian approach. For example, in figure 3, aerial, profile and frontal images of a fish appear and the user is asked to select the image that represents a fish. In this instance, the user has selected the aerial view shown on the left. The response distinguishes between point of view and completeness of information. Noting that all three images in the previous screen represent a fish, the next screen asks users to choose which image an Egyptian artist, intent on the most complete information for an image that would live forever, would select. (figure 4). When the user selects the profile view in the center, the program affirms that the user is thinking like an Egyptian artist and also shows the same form in a U.S. Forest Service sign to designate good fishing areas. By showing the visual logic of complete and clear information in our own environment, the program establishes links with Egyptian visual thinking and our own culture.

For the rectangular pool, users imagine the shape of the rectangular pool from verbal descriptions of different viewpoints (not shown) and in the next screen they choose which viewpoint would be appropriate for the Egyptian artist (figure 5). In the example, the user decides the aerial viewpoint contains the most complete information for the rectangular pool.

After users select the viewpoint for each individual item, they move to assembling the components and contending with problems created by placing the forms in a visually consistent way (figure 6). Through animated overlays, users can see the painting take shape and explore the effect of different choices. At any point, users may select to view the animated overlays superimposed on a neutral background or on the Egyptian painting shown in figure 2.

The placement of the trees around all four sides of the pool creates problems for the artist intent on clear and complete information. For the trees on the left side, the artist can choose to maintain the orientation and conceal the trunks of two trees (figure 7) or to clearly show the number and shape but shift the orientation (figure 8). The Egyptian artist's freedom to select the viewpoint appropriate for each object leads to this solution. Preliminary tests show that users quickly grasp Egyptian visual logic and can readily tackle the problem solving approach needed to place trees around the pool in a clear manner.

By participating in Egyptian visual logic, students gain a fuller understanding of the art and establish a measure of comfort and confidence with the images from a different culture. Since art history survey courses typically include Egyptian art at the beginning of the course, this approach opens the door for investigating other types of visual logic.

Contemporary Comparisons. After users delve into the visual logic of Egyptian art, they compare this approach to the visual logic of a contemporary landscape artist who paints the same subject on the basis of what he sees. Users can opt to conceal or compare the Egyptian work with the contemporary example. As the previous software segment traced the decision making process of an Egyptian artist, this segment notes the decisions and problems encountered by 20th century artist Glen Bartlett when he paints a rectangular pool surrounded by trees and stocked with ducks and fish. Although he knows it is a rectangle, he depicts the pool as a trapezoid because that is how it appears (figure 9). Glen Bartlett cannot paint the fish since they appear below the water surface; while he knows they are there, he can't see them (figure 10). Although the trees are all the same size, he must depict them as different sizes since the ones farthest from him appear to be smaller. The front trees create a special problem; if he omits the trees to show the ducks then he isn't painting what he sees and if he includes the trees in the front he must obliterate the ducks (figure 11). To maintain visual consistency, he covers the ducks with trees.

In contrast to textbooks which present Glen Bartlett's approach as a realistic standard characterized by "optical fact" and "keen observation", the software reveals how this visual logic leads to conscious distortions and omissions. Comparisons reveal similarities as well as differences: both the Egyptian artist and Glen Bartlett use limited systems based on visually logical approaches to representation. For the Egyptian artist, the goal is a timeless image to exist for all eternity and for Glen Bartlett, the goal is an image based on the artist's viewpoint at a moment in time (figure 12).

Conclusion

In *The Unschooled Mind*, Howard Gardner observes that a major impediment to teaching is the durability of ideas formed early in childhood. (Gardner, 5, 3). Gardner's observations, valid for K-16 education, pertain especially well to multicultural disciplines such as art history. To help students stretch beyond the comfortable visual assumptions of a lifetime, instructors need to develop active methods for involving students in different approaches to visual thinking. The classroom exercise and software present methods for expanding visual thinking and leading students to recognize the logic and limitations of both the familiar and the foreign.

Credits

Text:
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Photography:
figure 2. Garden with Fish Pond, fragment from tomb, Thebes. 18th Dynasty, painting. 26 cm. ht (London: British Museum) Copyright © British Museum. Reproduced by permission of the British Museum.

Software:
Schiferl, E. *Thinking Egyptian*. (ArtYes Productions). Copyright © 1994 Ellen Schiferl.

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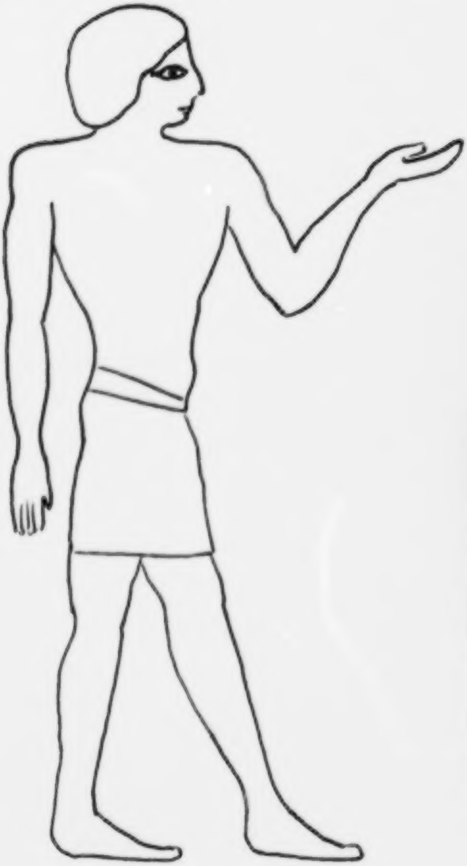

figure 1

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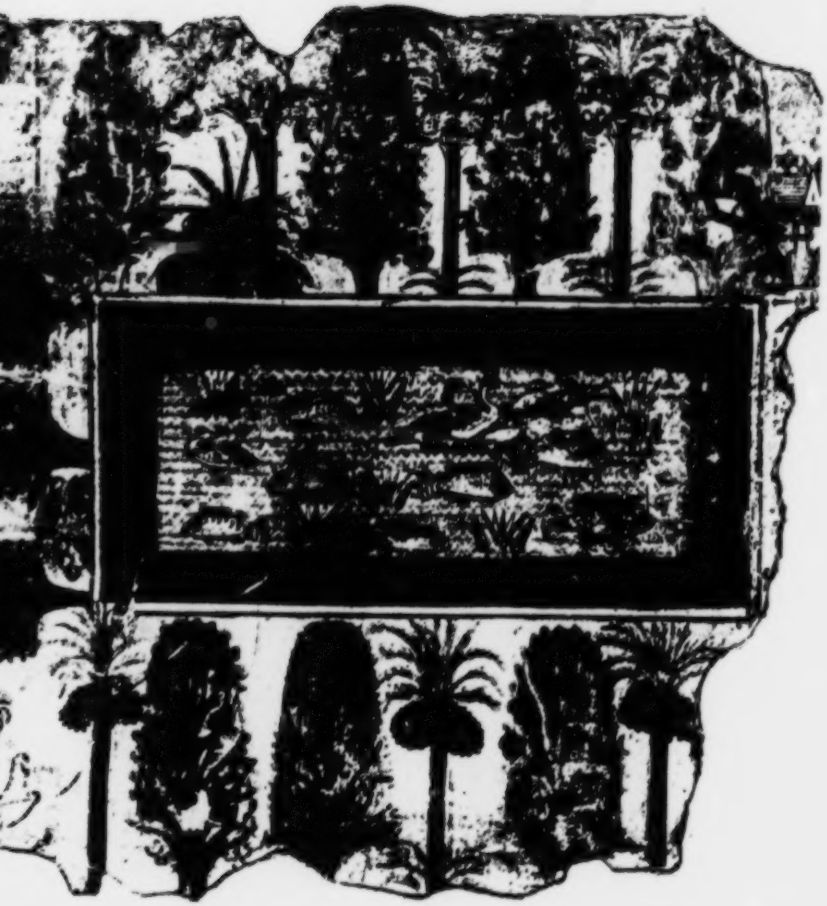

figure 2

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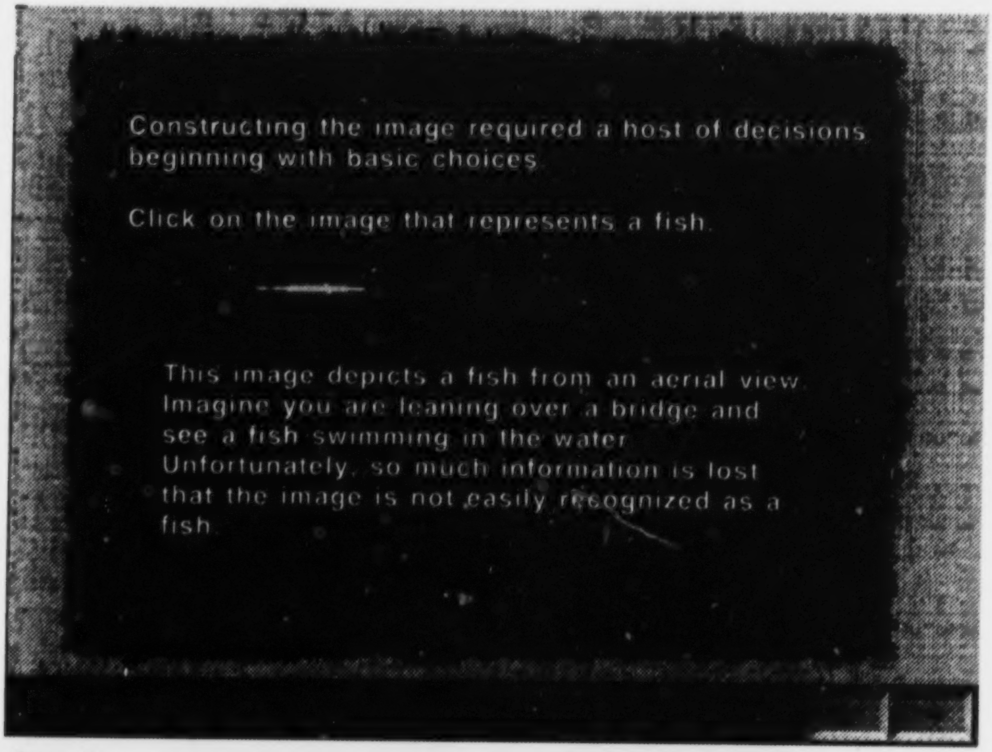
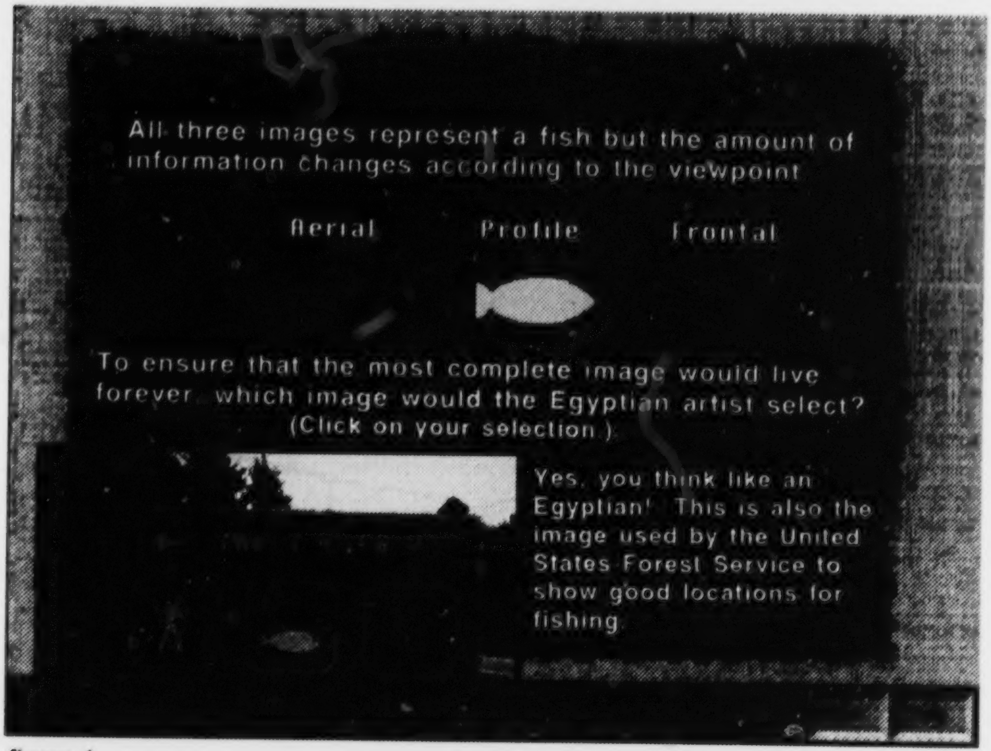


Constructing the image required a host of decisions beginning with basic choices.

Click on the image that represents a fish.

This image depicts a fish from an aerial view. Imagine you are leaning over a bridge and see a fish swimming in the water. Unfortunately, so much information is lost that the image is not easily recognized as a fish.

figure 3



All three images represent a fish but the amount of information changes according to the viewpoint.

To ensure that the most complete image would live forever, which image would the Egyptian artist select? (Click on your selection.)

Yes, you think like an Egyptian! This is also the image used by the United States Forest Service to show good locations for fishing.

figure 4

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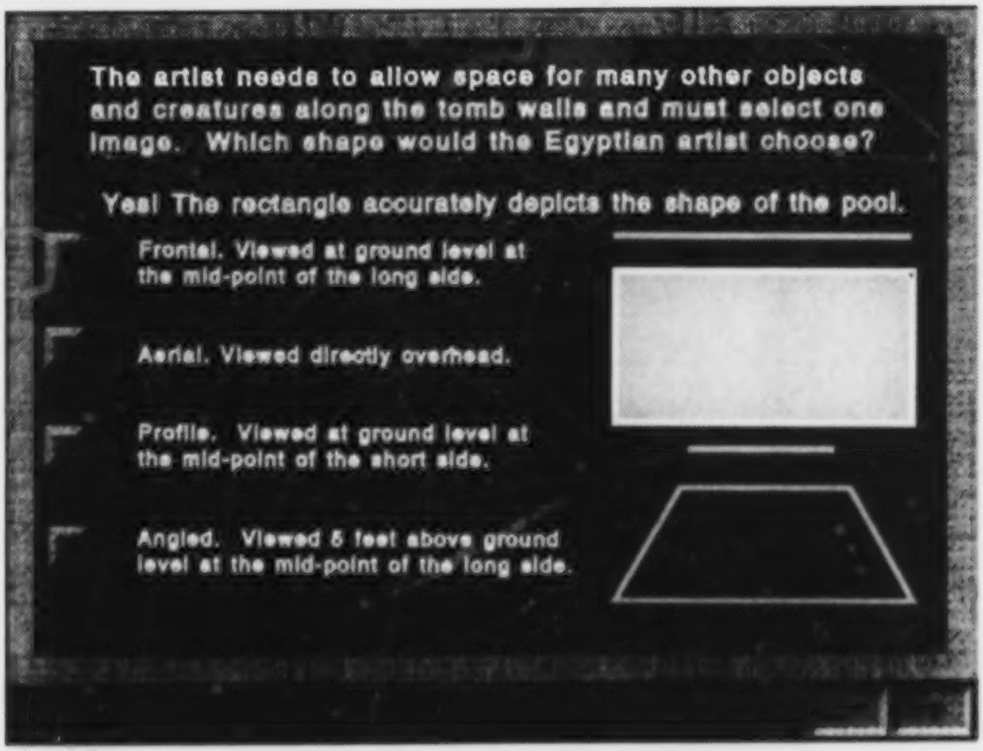
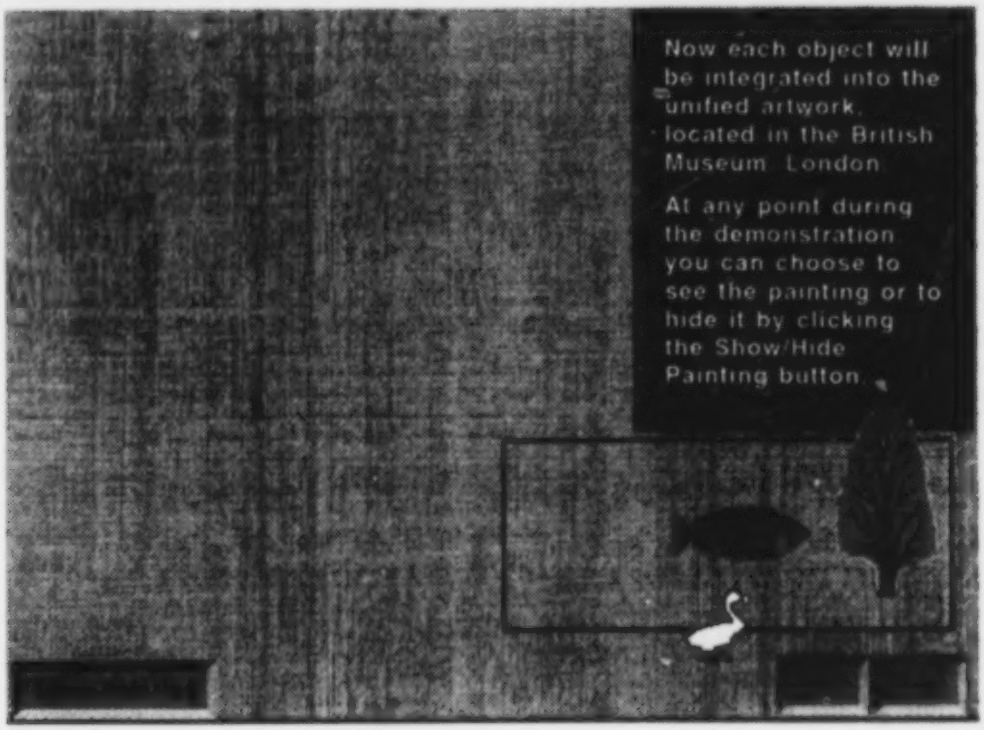


The artist needs to allow space for many other objects and creatures along the tomb walls and must select one image. Which shape would the Egyptian artist choose?

Yes! The rectangle accurately depicts the shape of the pool.

- ☐ Frontal. Viewed at ground level at the mid-point of the long side.
- ☐ Aerial. Viewed directly overhead.
- ☐ Profile. Viewed at ground level at the mid-point of the short side.
- ☐ Angled. Viewed 5 feet above ground level at the mid-point of the long side.

figure 5



Now each object will be integrated into the unified artwork, located in the British Museum, London.

At any point during the demonstration you can choose to see the painting or to hide it by clicking the Show/Hide Painting button.

figure 6

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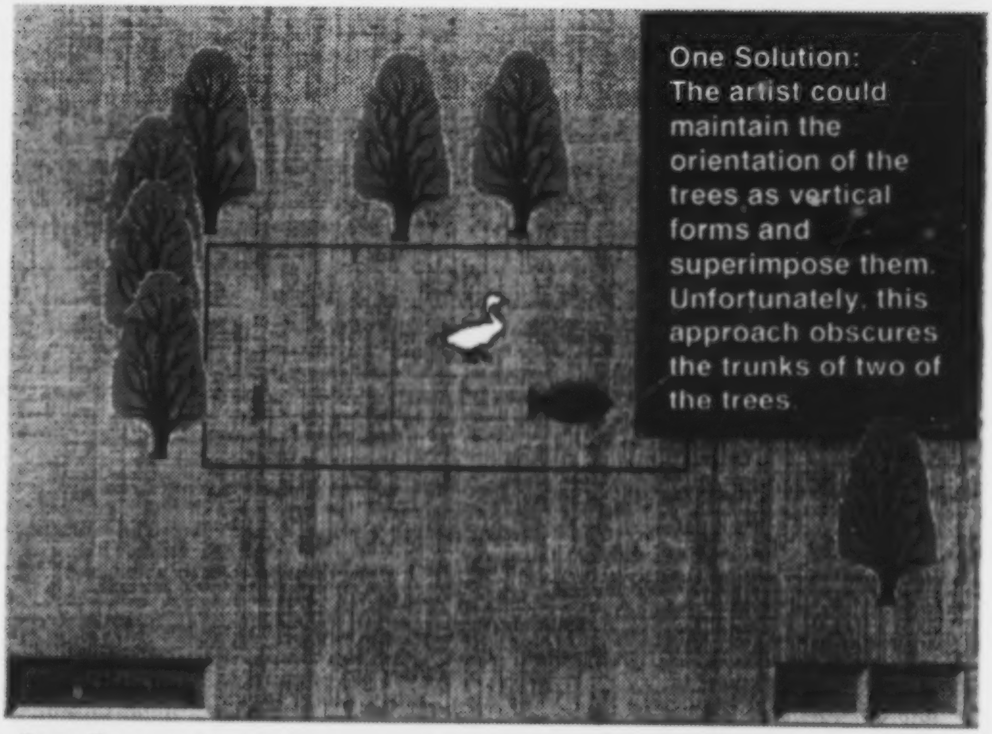
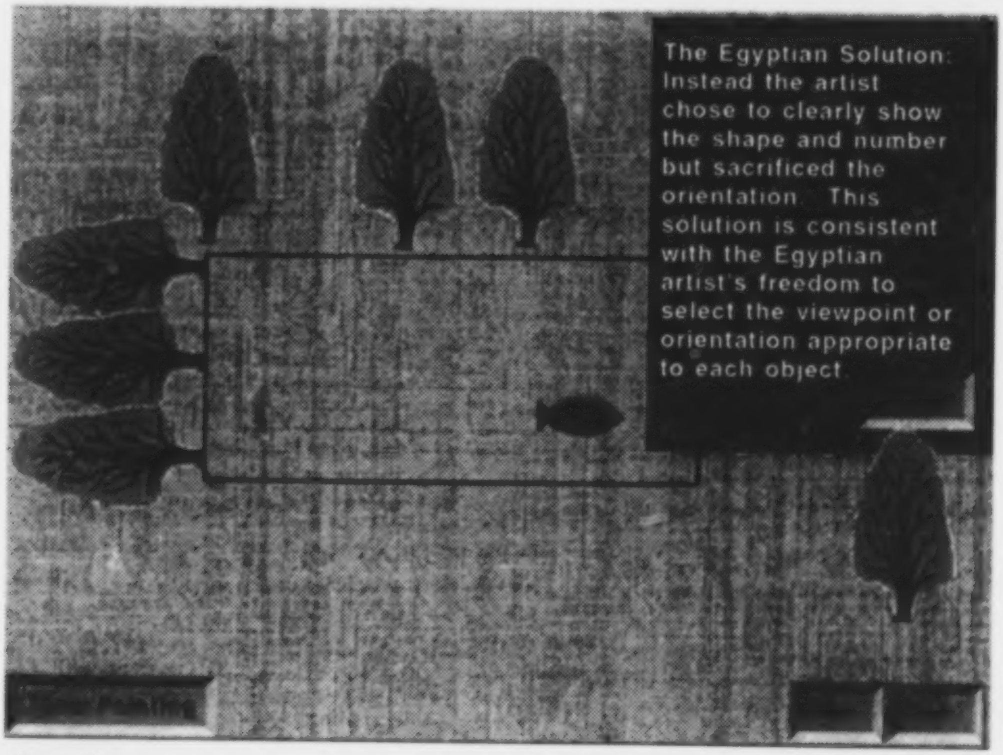


One Solution:
The artist could maintain the orientation of the trees as vertical forms and superimpose them. Unfortunately, this approach obscures the trunks of two of the trees.

figure 7



The Egyptian Solution: Instead the artist chose to clearly show the shape and number but sacrificed the orientation. This solution is consistent with the Egyptian artist's freedom to select the viewpoint or orientation appropriate to each object.

figure 8

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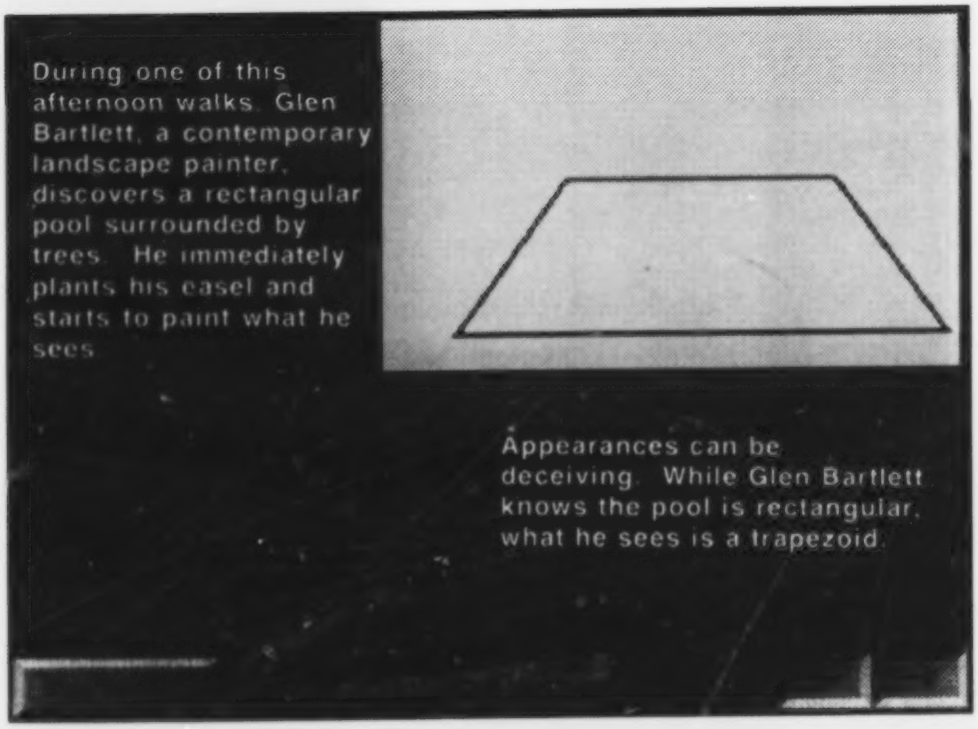
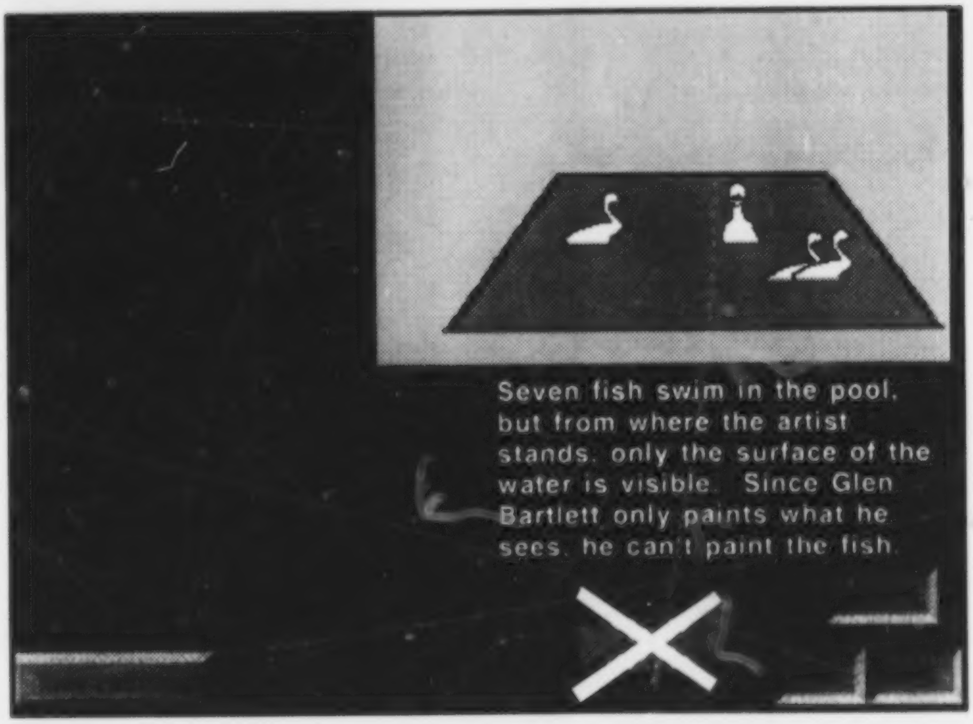


During one of this afternoon walks. Glen Bartlett, a contemporary landscape painter, discovers a rectangular pool surrounded by trees. He immediately plants his easel and starts to paint what he sees.

Appearances can be deceiving. While Glen Bartlett knows the pool is rectangular, what he sees is a trapezoid.

figure 9



Seven fish swim in the pool, but from where the artist stands, only the surface of the water is visible. Since Glen Bartlett only paints what he sees, he can't paint the fish.

figure 10

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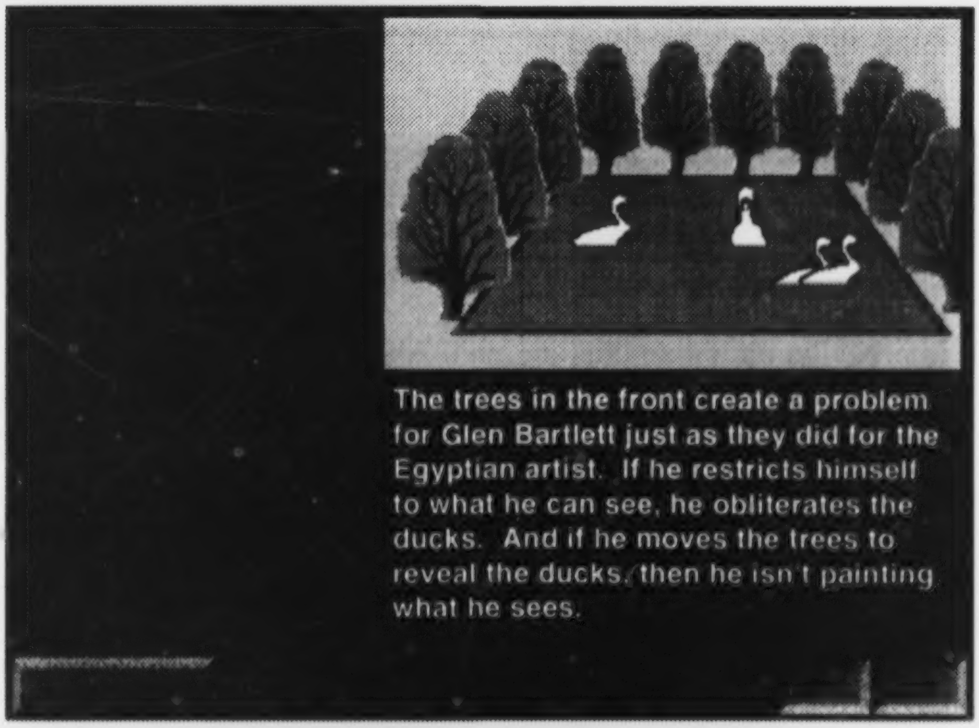
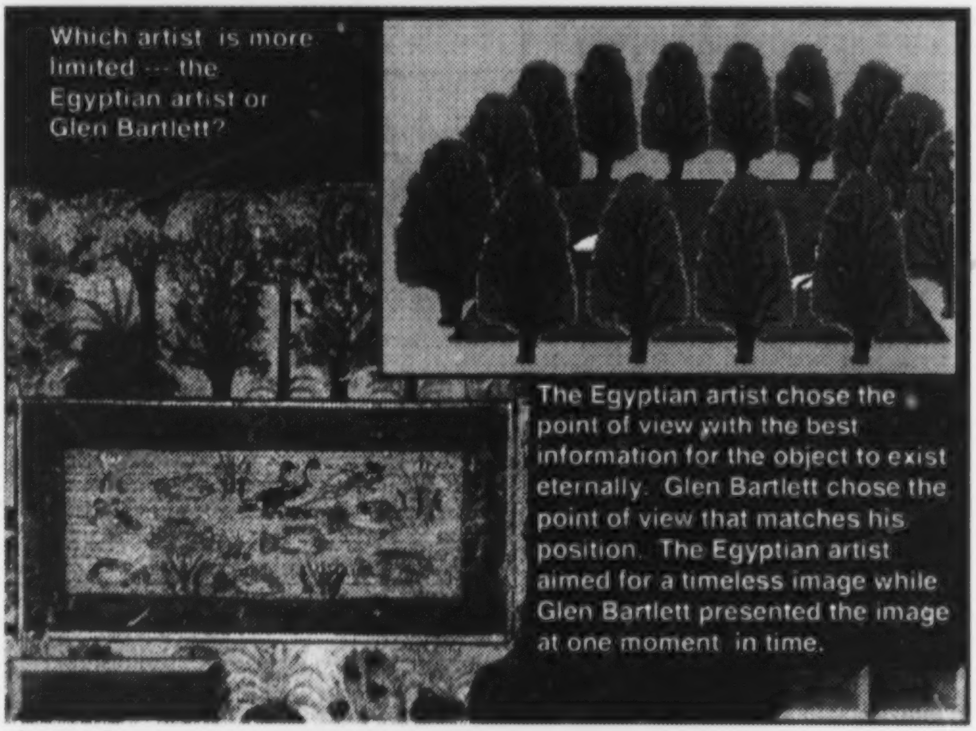


The trees in the front create a problem for Glen Bartlett just as they did for the Egyptian artist. If he restricts himself to what he can see, he obliterates the ducks. And if he moves the trees to reveal the ducks, then he isn't painting what he sees.

figure 11



Which artist is more limited --- the Egyptian artist or Glen Bartlett?

The Egyptian artist chose the point of view with the best information for the object to exist eternally. Glen Bartlett chose the point of view that matches his position. The Egyptian artist aimed for a timeless image while Glen Bartlett presented the image at one moment in time.

figure 12

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Gender Stereotyped Computer Clip-Art Images as an Implicit Influence in Instructional Message Design

Jane C. Binns
Robert C. Branch

The prevalent use of computer-generated images for use in instructional messages has prompted software developers to produce electronic "clip-art" libraries of people, places and objects which can be copied and pasted into other computer-generated documents. The place images and object images available from contemporary electronic clip-art libraries represent a variety of instances, however, there is a lack of diversity represented among the available people images for these same clip-art libraries. Regarding gender, women and men are portrayed differently in clip-art libraries of graphic software packages. The array of pictorial options depicting women and men is typically unbalanced, and often connotes stereotypical perceptions. Men are predominantly shown in positions of authority and leadership, whereas women generally are shown in subordinate roles often serving or assisting others. Such limited portrayals of people and stereotypical gender characterizations increase the potential for misrepresentation and is likely to bias the final version of any document. The thesis here is that gender stereotyped computer clip-art images implicitly influence instructional message design.

The purpose here is to sensitize instructional message designers to the stereotypical signals which may be inherent in computer clip-art selections. Presented here are rationale about the power of message design, the differences between gender equality and gender equity, and recommendations for promoting diverse, equitable and balanced applications of computer clip-art images for use in instructional messages.

Message Design

Computer clip-art images are utilized most often to improve the design of messages. Message design is the intentional arrangement of elements to communicate an idea, thought or theme. Grabowski (1991) defines message design as planning for the manipulation of the physical form of the message. Message design encompasses principles of attention, perception and retention that direct specifications for the physical form of messages which are intended to communicate between a sender and a receiver (Seels & Richey, 1994). Fleming and Levie (1993) refer to instructional message design as "specifying the characteristics of appropriate instructional messages" (p. *x*). Message design as a domain of visual literacy is the intentional arrangement of *visual* elements to communicate an idea, thought or theme. Visual literacy refers to a group of vision competencies a human being can develop by seeing and at the same time integrating other sensory experiences. Visual literacy is based on the assumptions that:

1. interpreting visual images is idiosyncratic,
2. reading visual messages is a learned capability, and
3. through the use of visual competencies,

   we can design messages which enhance the potential for learner achievement.

Instructional message design facilitates the learning of content. Content, as a body of knowledge, exists within an organized structure and for which the structure reflects the interrelationships among the facts, concepts, and principles that make up the content. Content structure is often formed through the use of visual elements. Grabowski and Pearson (1988) contend both content and form can influence student achievement separate and apart from another. People learn content, as well as the structure which interrelates the content, concurrently. A characteristic of message design is that designs should be specific to both the medium and the learning task (Fleming, 1987; Fleming & Levie, 1993). The contention here is that content structure as a message form also communicates personal perspectives and cultural norms. A review of people images that are commonly incorporated into instructional presentations imply stereotypical messages and often send mixed or unintended messages.

A review of instructional documents suggest that people who incorporate graphics into their work tend to do so irregularly, with varying quality, and rarely do so based on empirically supported principles of message design. According to Semrau and Boyer (1991), the integration of visuals in educational software has a greater impact on the learner than the use of words alone. Further, "incorporating graphics into one's screen design does not come easily for most educators who are not trained in art of design" (Semrau & Boyer, 1991, p. 25). Semrau and Boyer suggest software programs can be critiqued according to explicit visual criteria and cultural factors. Semrau and Boyer recommend the following criteria checklist which can be used to evaluate the effectiveness of screen designs:

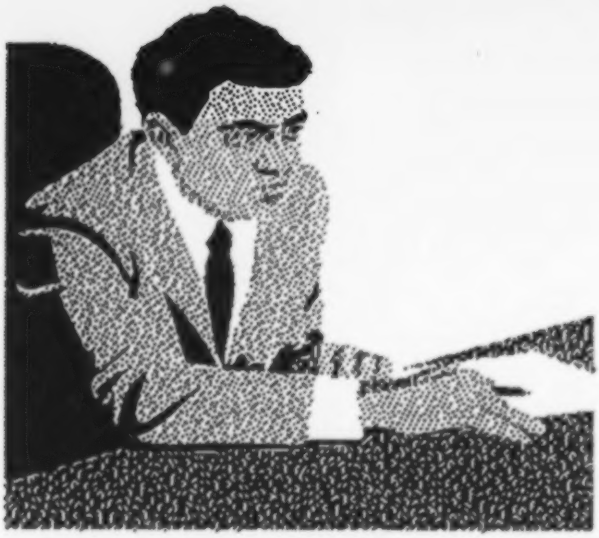
1. Unity
2. Balance
3. Style
4. Repetition
5. Contrast
6. Composition
7. Multicultural Representation
8. Equality of Gender
9. Social Issues

Message design should be scrutinized based on cultural criteria as well as aesthetic criteria. Because different cultural groups perceive and decode visual materials in different ways (Heinich, Molenda & Russell, 1993), an understanding of message design criteria helps to better achieve instructional objectives and promotes quality learning experiences. Incorporating cultural diversity throughout instructional content has many benefits (Anti-Defamation League of B'nai B'rith, 1988; Banks, 1989; Branch, Brigham, Chang & Stout, 1991; Branch, Brigham, Chang & Scheel; 1992; Dees & Bullard, 1992; Knott, 1991). Diversity of visual presentation allows for an opportunity to appreciate the nuances of cultural groups relative to religion, family, traditions and ancestry, as well as the obvious differences commonly portrayed in mass media. However, before any attempt can be made to incorporate culturally pluralistic perspectives into instructional message design, it is important to understand culture is a patterned way of thinking, feeling and reacting to the environment. Culture is transmitted mainly by symbols and actions; and that regardless of the subject, there is a personal commitment required to identify alternative perspectives based on different cultural orientations (Branch, Goodwin & Gualtieri, 1993). Successful message designs require personal commitment to facilitate maximum learner achievement.

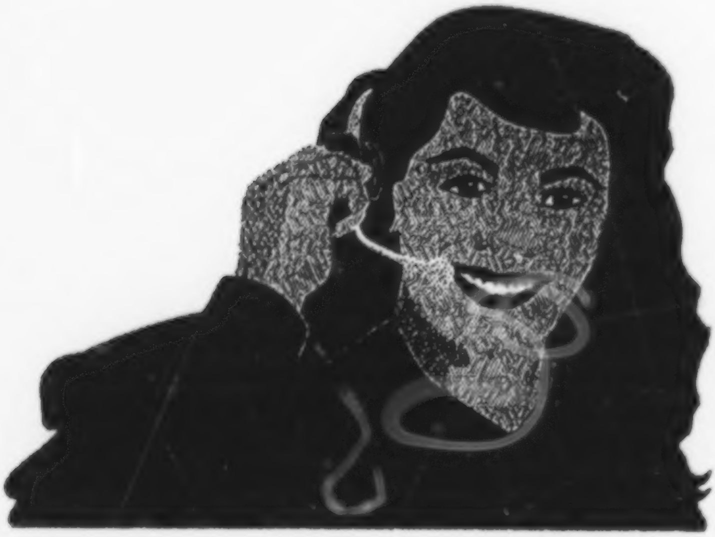
Equality and Equity

The greater number of male images available in many clip-art libraries may communicate that which exists in society [that there are more men in positions of authority and power than women], but it also reinforces an implicit stereotype that men are superior to women. The content of male images may also communicate that which exists in society [that men are allowed to do a lot more than women], but that too implies a stereotype. Both the number of images and the kind of images in computer clip-art libraries representing women and men raise issues of equality and equity.

Equality tends to be defined in terms of balance; or being the same measure. Equality in computer clip-art images would mean providing the same number of images and similar content images of women and men. Regarding the equality of gender, Semrau and Boyer (1991) suggest the contributions of both women and men in all types of roles including professional, vocational, managerial, and executive roles need to be incorporated into the [message] design. Men are often depicted in significant leadership roles while women are typically depicted in supporting roles. Men are the medical doctors or the chief executive officers and women are the nurses or secretaries (Figure 1). While there may not be as many women in positions of authority or in jobs such as construction workers, or as many men in subordinate positions or in jobs such as telephone operators and secretaries, in reality they do exist. Images may portray what exists in society, however, they also reflect social constructions. Clip-art people images in graphic software packages often reflect more than socially constructed "normal" images. Images communicate who we are as well as who we can become. The power and implicit influence of stereotypical images can have a substantive impact on the perceptions of ourselves. Therefore, instructional designers are obligated to construct balanced messages from available resources. Clip-art libraries of people should provide images for which designers can identify and utilize to communicate comprehensive messages. Libraries with images of limited characterizations constrain one's ability to express or instruct, thereby creating an inherently inequitable situation.



Executiv - Corel



Telegirl - Corel

Figure 1. Men typically portrayed in position of authority while women are typically portrayed in a supporting position.

Equity is defined in terms of what is just and fair. It is *un*just when women are primarily portrayed as telephone operators or secretaries and when men are portrayed primarily as bosses or leaders. Images implicitly inform people of what one is "allowed" to do or be able to achieve. There should be explicit attempts to increase the number of computer clip-art images depicting female supervisors, technicians and managers. A lack of diverse and representative images inhibits one's ability to teach about changing roles and diminishes the possibility for the learner or viewer to accurately conceive available careers. Graphic software creators have a responsibility to present females and males in a variety of roles and present equal numbers of non-stereotypical images.

The origins of stereotype and their roles in society are beyond the scope of this presentation, however, a review of the denotations of stereotype is appropriate. Stereotype is defined by Webster as a metal printing plate cast from a mold made from set type; or an unvarying form or pattern. Such denotation is appropriate for the industrial age practice of setting immovable type, but such denotations are inappropriate for instructional message design. Webster also defines stereotype as a fixed or conventional notion such as of a person, group or idea which is held by a number of people, and allowing for no individuality or critical judgement. Fixed notions are also inappropriate relative to instructional message design.

Images do influence individual perception. Cash and Brown (1989) explored stereotypes and realities of gender and body images by comparing female and male perceptions of sex differences in body image to the actual differences between the sexes. Results indicated females and males alike perceived females to have more negative evaluations of their appearance, their fitness, their health, and were more dissatisfied with their bodies. The perception was that females were more appearance-oriented, more health-oriented, and more illness-oriented, but less fitness-oriented. Females were also believed to label their weight as heavier, experience more anxiety about becoming fat, and were more conscious of small weight changes. Females were also thought more likely than males to be on a weight-loss diet, and to report more frequent episodes of eating restraint. The perception of females among female and male participants in the Cash and Brown (1989) study was that negative evaluations existed on all 13 measures of the study, however, there were only eight actual negative evaluations for females and the habits they reported. The perceived negative evaluations on all thirteen measures as compared to the eight confirmed sex differences provides general support for stereotypical mis-perception of body-image attitudes toward gender.

Images in commercial media do teach us to some extent how to look, how to act, what to worry about and what to enjoy. Advertising implicates television and other media as powerful influences on the viewer. DeVaney (1994) purports "that the visual image is a ubiquitous teacher in this post modern age. Children are introduced to their world primarily through images, especially popular culture, images on television, in films and in advertisements" (p. 356). The discourse in print media such as that found in commercial advertising, which is occasionally utilized in classroom instruction, can also make inferences about what students ought to consider as important.

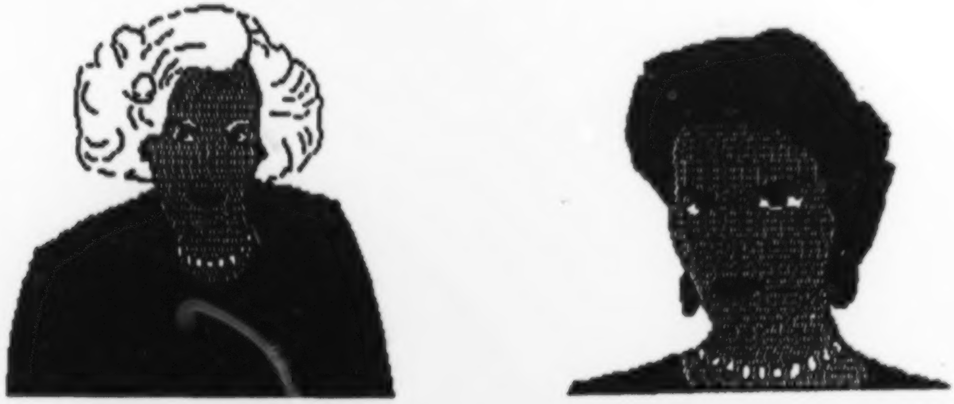
Similarly, images found in electronic media, such as computer assisted instructional materials, can implicitly offer unbalanced, mono-cultural portrayals of gender. Kilbourne (1990) conducted a study on male-female perceptions of leadership using the portrayal of women in advertising. The study's premise suggested that roles portrayed by a woman in an advertisement can provide information from which a viewer will determine conclusions about a woman and generalize key characteristics to other women. Kilbourne found that men perceived women to have greater managerial abilities when depicted in professional roles. Women did not perceive women professionals as having any more or less managerial abilities than women depicted in domestic roles such as housewife. The Kilbourne study supports the notion that non-stereotypical images can offset stereotypical perceptions. Another implication of the Kilbourne study is that the use of gender role stereotypes in advertising can have an adverse effect on a person's ability to accurately judge another's ability. Kilbourne also suggests that advertising does not engender stereotyping, but so long as stereotypical gender roles are portrayed in advertising and the media, they do contribute a significant influence to one's perception.

Gender Language in Computer Clip-Art Libraries

Gender stereotype images in clip-art libraries have been presented in relation to their implicit influence in instructional message design. Another discriminating factor in computer clip-art libraries is the language used to identify people images. Gender stereotyped language include: newsman, businessman and workman. Gender stereotyped career images include: nurse, secretary and stewardess. According to the American Psychological Association (1994), individuals should avoid ambiguity in [gender] identity or [gender] role by choosing nouns, pronouns, and adjectives that specifically describe people. "The use of *man* as a generic noun or as an ending for an occupational title (e.g., policeman) can be ambiguous and may imply incorrectly that all persons in the group are male" (American Psychological Association, 1994, p. 50).

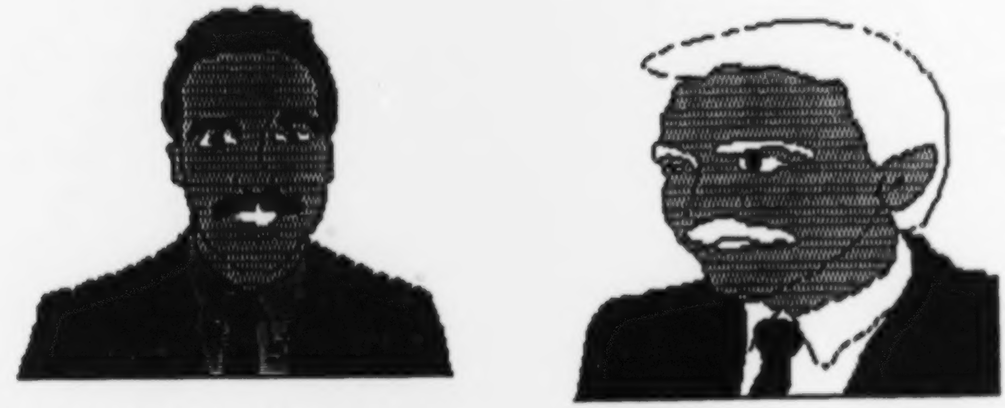
Several computer clip-art libraries were analyzed including Corel Draw, Olduvai, Hypercard, Image Club, Storyboard Live!, Totem and Word Perfect. Consistent themes emerged throughout these libraries. Females were portrayed in less than half the number of images as males. The images of females working consisted primarily of sitting at a desk, speaking on the telephone, or posing, as in modeling. The images of males working consisted primarily of positions of authority or leadership such as a boss, executive or foreman. The images of women consisted primarily of positions of subordinates such as secretary or nurse.

Female images in more than a few instances were either labeled using sexist terminology such as "stewardess" or the labels were so vague, the viewer could not anticipate an image: "woman 1;" "woman 2." Terms like "stewardess" are problematic because culturally, "flight attendant" is the widely-used label for the person who serves you on an airplane (Figure 2). Labels such as "woman 1" or "woman 2" do not aid the viewer when searching for a particular kind of image. Male image labels in contrast were typically specific so that the viewer might anticipate the appearance of an image. The difference between female and male image labels effectively discourages the viewer or designer from using one kind of image and encourages another. The use of vague or stereotypical labels may also imply the importance of one image or gender over another.



Woman 01 - Storyboard Live!

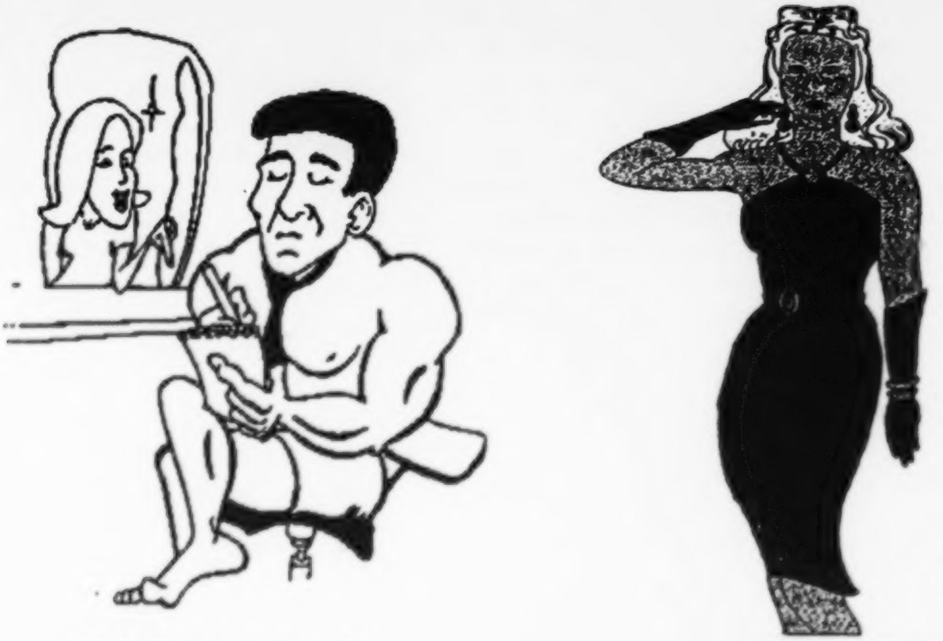
Woman 02 - Storyboard Live!



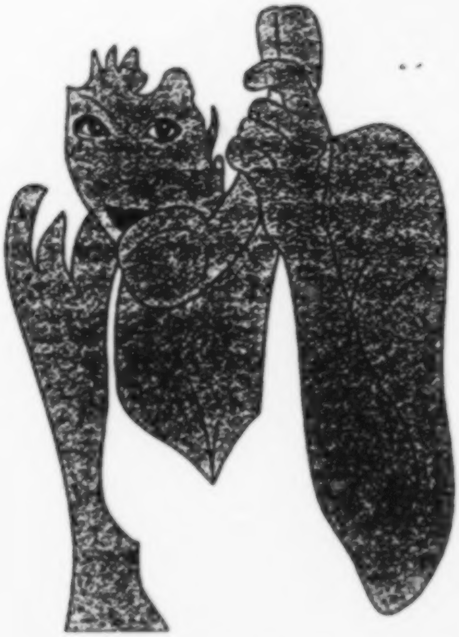
ManFront - Storyboard Live!

ManAngle - Storyboard Live!

Figure 2. "Woman 1" / "Woman 2." Vague description of actual library images or nondescript label of actual image. In contrast, "Man Front" and Man Angle" provide better descriptive information.



Male_Sec - Image Club **Hostess - Corel**



Phone195 - Corel

Figure 3. Examples of lack of variety and lack of non-stereotypical gender values in computer clip-art library images.

Corel Draw contained the greatest number and variety of people images. Male images in Corel Draw outnumbered female images by more than two-to-one. The male images also represented a wider variety of images. Working men were bosses, and executives but also construction workers, doctors, computer operators and technicians as well as architects. The female and male images in Storyboard Live! revealed messages regarding appearance and gender values. There are eight images of men and only three of women in the people library; the three female images are of a "secretary", "nurse" and "stewardess" (Figure 3).

Recommendations

An intentional effort should be made to present non-stereotypical images as more and more computers are used in instruction. Educational software containing graphics and clip-art libraries with images of people should portray female and male images for which all students can identify, and depict careers which all students can aspire. The following recommendations are offered as initial steps to promote accurate gender portrayals in instructional messages which incorporate images from computer clip-art libraries to facilitate learning.

Recommendation #1

Avoid gender stereotyped images. Use non-gendered images.

Recommendation #2

Avoid gender stereotyped labels by using non-gender stereotyped labels such as "construction worker," astronaut" and "news broadcaster." Relabel images so that terms are not gender-specific .

Recommendation #3

Create your own images. Computer clip-art packages such as Illustrator, Deluxe Paint, Microsoft Paintbrush, Photoshop for IBM, and Superpaint, and Pixel Paint for MacIntosh provide means for the designer to create her or his own images.

Recommendation # 4

Scan images from photographs or printed artwork.

Recommendation #5

Advocate computer clip-art libraries which promote diversity, equity and balance through a broader variety of images portraying women and men.

Recommendation #6

Inform computer software companies about your preferences.

In order to truly adopt a learner-centered approach to education, all students should be given the opportunity to dream about whom they might become. Positive role models as represented in images do make a difference. The scope of this examination explored gender differences and stereotypes as depicted among computer clip-art images. Other areas deserving exploration are computer clip-art images relative to nationality and culture.

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Imagery in Scientific and Technological Literacy for All

Ora Silverstein

The visual component's significant place in research and study of the sciences is already known. New technologies, empowered by means of media communication systems are developing. Multimedia and hypermedia techniques enable creative usage of pictures and change the methods of learning in general and of the exact sciences and natural sciences (Silverstein, 1992). These substantial changes which took place in the 20th century not only enable but also obligate research and learning by visual-pictorial methods in the 21st century.

Today, the term "literacy" is the key for the requirements that educators and teachers have to fulfill the world over.

The year 1990 was declared International Literacy Year (ILY) by the United Nations. During ILY there were two major conferences which dealt with the theme of literacy and basic education. The first was the World Conference on Education for All held in Jomtien, Thailand in March 1990. After that the forty second session of the International Conference on Education (ICE) was dedicated to "the struggle against illiteracy".

There are many definitions of Literacy (Wagner, 1991) and the decision by the international institutions to bring literacy to the entire world caused research and clarification of this term.

One of the most important consequences of studying the meaning of literacy is the definition of a new term: "Scientific and Technological Literacy", born from the acknowledgment of the importance of science and technology (Haggis, 1993). UNESCO, the renown United Nations Educational Scientific and Cultural Organization, decided to adopt measures which, if indeed adopted, will justify the letter "S", standing for "Scientific", in its name.

It was stated, following general agreement at UNESCO, that given the role science and technology play in economic and social development in today's world, scientific and technological literacy must be given priority as an essential component of basic education (Bowyer, 1990).

UNESCO promoted an inter-national activity called "Project 2000+", whose objective is to provide Science Literacy for all in the 21st Century. For this huge task, representatives from 80 countries gathered at the Scientific International conference called Science Education in Developing Countries - from Theory to Practice which was held in Jerusalem (Israel) in January 1993. Leading researchers in the teaching of sciences, as well as representatives from under-developed countries participated in the conference. The conference was established for sharing and devising ideas for reaching the next step of the plan for proper implementation in various countries.

It was agreed that: "scientific, as well as technological literacy stand out as goals of the science education needs for the 21st century, if developing countries are to understand and participate in science and technology (Bajah, 1993).

It was also recommended that developing countries should set up National Tactical Committees to plan their Science Education Programs for the year 2000+.

Following the conference, a work seminar was held, called the International Forum on Scientific and Technological Literacy for All (UNESCO, Paris 1993). 450 representatives from the whole world took part in the Forum. Work was carried out in groups, according to predetermined objectives and guidance, and following a preliminary preparation and reading of literature. The questions and conclusions raised were summarized in the Final Report and "The Project 2000+ Declaration".

Today we may say that there is an international consensus concerning the objectives and means of distribution of Scientific and Technological Literacy for All, and there exists an infrastructure and operative network for the implementation and continuation of the project.

Project 2061 in the United States is an example which enables us to follow the activities of the above mentioned objectives. This is a so-called "SATS" approach, (Science, Technology, Society), which is presently the most common method of science teaching in the Western World.

The "Project 2061" was launched in 1985, the year when Alley's Comet passed close to Planet Earth. It is a long-term reform initiative for science literacy of the American Association for the Advancement of Science (AAAS). Its goal is to improve the quality, increase the relevance and broaden the availability of the natural and social sciences, mathematics and technology for all students (kindergarten through twelfth grade) who would live to see the return of Alley's Comet in 2061.

Science literacy, as defined in Science for All Americans (Project 2061's 1989 report): is concerned less with students mastering these disciplines, than having them understand the world through the "eyes of science". Project 2061 is trying to establish "a vision for achieving science literacy" (Rutherford, 1993). These successful metaphors are currently without link to Visual Literacy Theories.

It should be emphasized that there is a huge gap between the declarations found in literature written in the course of the two last years within various academic and managerial frameworks on Scientific and Technological Literacy for All, that certainly mean well, and the concept accepted by those who are conscious of the substance of Visualization. The concept of Visualization, which has been widely written about by Roth (1993), Tufte (1990), DiBiase (1990) and also others, has significant consequences regarding the correct method of acquiring Science Literacy.

DiBiase speaks about "scientific insight through visual methods". One of the most important examples that he exposes is Kekule's vision of a snake, as a visual metaphor for the ringed structure of benzene. This example is quoted from Jung (1968), who explains that the German chemist (of the 19th century) dreamed about a snake that holds his tail in his mouth, a most ancient symbol. Kekule deducted from this dream his interpretation to the well-known ringed structure of benzene, where 6 carbon atoms are tightly linked to each other by strong covalent bonds.

DiBiase writes that since Plato, who warned of the illusory nature of sensory images, western educational systems have stressed fluency with words and numbers as the legitimate modes of reasoning. Graphics, which depend on visual perception, are less valued because perception has been assumed not to involve thought.

DiBiase mentions Rudolf Arnheim, whose book Visual Thinking (1969) has great importance for all those who deal with acquiring Scientific and Technological Literacy for All. While all the written material dealing with science education in the 21th century is abundant with words and numbers, but almost without any tables or illustrations and the manuals for all those who deal with Science teaching are full of abstract phrases, this book emphasizes the subject of Vision in Education.

People who deal with teaching of sciences in the western world are aware of the results of research conducted in the last decade, showing that most students have misconceptions about physical - natural phenomena (Wandersee, 1986). However, no sufficient thought has been dedicated in science teaching to the procedure of image and symbol formation and the formation of concepts in human cognition. Howard (1987, pp. 16-37), states that the structures that are used to build perception are existing images and symbols. Following research observing more than 1000 pupils and teenagers, Silverstein & Tamir (1992), have shown the importance of visual thinking in understanding scientific concepts. Their research agrees with the theory of Howard (1987) based on Bruner concluding that a person has a mental image of his perceptions as soon as at the end of the first year of his life.

Arnheim (1969, pp. 294) concludes by saying that "visual perception lays the groundwork of concept formation. The mind, reaching far beyond the stimuli received by the eyes directly and momentarily, operates with the vast range of imagery available through memory and organizes a total lifetime's experience into a system of visual concepts".

Dondis (1973) gives examples of symbolism and states that abstraction toward symbolism requires ultimate simplicity. This way of thinking is complementary to the many examples appearing in books dealing with Picture Writing of the American Indians (Mallery, 1972), such as the petroglyphs in Arizona that are characteristic of the drawings of the Indians in America (Stokes & Stokes, 1991). Pictures drawn by Indians of the Hopi tribe in Arizona join those of Indians in Colorado, Utah, New Mexico and Nevada. You can find there pictures dealing with abstract scientific concepts, such as "weather" and "water" and with technologies used by those tribes. You will see pictures of snakes used as symbols and pictures of various plants and animals together with pictures of folklorist motives (William & William, 1980). You may encounter some of these pictures even today, in pupils' notebooks and in modern science books. One example is a picture describing a liquid in a bottle, with dots scattered above it (Martineau, 1973). The discovery of such a picture in a culture that apparently was not acquainted with the atomic particles of the substance, is most interesting.

The Indian culture, which did not have written verbal language and used sign language and picture writing for communication, is a proof of Arnheim's theory. The Indians used visual symbols to express their thoughts and establish human communication. The concept of "life" was illustrated in this culture as a circular drawing. In biology, the term "life-circle" is one of the most important ones and is connected to the understanding and perception of the life cycle that we try to teach children in elementary school.

A tree is pictured schematically in the Indian picture writing, as it would appear in a modern book of botanics. In order to express "sunrise" and "sunset" in picture writing, the Indians used drawings of circle sections - which proved their understanding and awareness of the fact that the world is round. There is no doubt that a deep insight of the pictures, symbols, sign language and narration in Indian culture, as compared with other primitive cultures that existed on earth and the understanding that human thinking is based upon a collection of stimuli stored in the individual and universal memory, may largely contribute to the choice of the correct method for science teaching in the 21st century.

Understanding of the visual basis of human thought could bring about a more intelligent equilibrium between the written word and the visual-acoustic components in acquiring Literacy for All, including Scientific and Technological Literacy for All.

It should be noted that there is an extreme variety of teaching levels and methods in science teaching all over the world, and also among the developed countries. Verbal teaching, which ignores the use of media technologies is still being used in many places. There is the other extreme of using the so-called Scientific Visualization in a number of schools and universities.

Scientific Visualization is a new movement synthesized from the parent fields of computer graphics, simulation, image analysis and applied art using the power of computer, multimedia and hypermedia techniques to transform information into visualizable form (Jolls, 1991). It is worthwhile using these innovative ideas and technologies in order to feed the visual desolation that exists when teaching in places and societies which have lost the natural attitude towards acquisition of knowledge and are now on the forefront of educational performance.

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Endnotes

1. The summary of Forum 2000+ is included in the following publication: UNESCO. (1993). International Forum on Scientific and Technological Literacy for All. Final Report.

2. The article summarizes the author's participation in both conferences mentioned on Scientific and Technological Literacy for All: the first in Jerusalem and the second in Paris (1993). Also participated in the preparatory session (held in Geneva, 1994) for two large women's conferences which will be held in Japan and China (1994) and will deal with girl child education. Visits to Africa and Russia (1994) and activity with the department of education in own city of residence enabled her to become acquainted with various educational realities.

Acquaintance with pictography of Indians in the United States is a result of visits to a number of National Parks and Indian reservations in the US, in 1992.

The Impact of Electronic Visualization: Concerns and Delimitations

Mary Buck

Old testament proverbs, children's well-loved bedtime stories, and *The Wall Street Journal* hold several things in common–strange news, hard to explain happenings, and visual images which can perturb or perplex the reader. Graphical images can, additionally, influence, teach, inform, motivate, persuade, and captivate audiences.

In telling our human stories, we practice the science and art of blending illustration and words for audience impact. The desire for particular audience reactions and results has led to a growing interest in a specialized mixture of classroom pedagogy, computers, along with oral and visual communication theories and practices during presentations.

Background

Visual presentations generated and controlled by computers pattern traditional media presentations in several ways. Both seek to produce and incorporate visual information for their audiences; both require time, investments, skills, and competencies.

In contrast to traditional media, computer-generated presentations have extended abilities. Computers incorporate and manipulate video, photography, audio, special sound effects, animation, line art, gray-scale images, color photos, and text.

Moreover, new media production can receive and control input from devices including telephones, satellites, compact and laser disks, electronic pens, touch screens, high and low resolution scanners, and even "smart agents" (Allen, 1994) which permit multinodal entry of data. Thus, pedagogical and technological concerns have enlarged since the emergence of these visually enhanced learning environments in the allied fields of education and business.

Business

Newly formed businesses which specialize in the creation of images generated and controlled by computers such as Graphix Zone in Santa Ana, California and New Horizon Computer Learning Center located in Irvine, California, are examples of profitable and growing new media companies–one in training and one in commercial productions. They provide production, training, and consultation for their clients. Both companies rely on the continued growth and viable applications of new media presentations.

Education

Production and training issues also hold true for our educational institutions as implementation of the current sophisticated electronic tools in our classrooms take hold. Like new media production companies, administrators face similar problems in instituting change in the classroom. Incorporating change in the classroom involves budget, instruction, and training issues.

All teachers eventually face the challenge of incorporating to some degree the new media communications channels for use in their classroom environment. However, not all teachers would become multimedia producers. In addition to time and budget, visualization utilizing new media technology requires the continuing recognition of the many, often opposing issues of culture, class, ethnic background, along with the individualized learning styles of which all audiences are composed.

Au (1993) defines the culture found in the classroom to include the ethnic biases of instructor and learner, in addition to class or socio-economic status and their learning language preference. This definition places the issue of cultural and educational diversity as an important concern and challenge to all in the mainstream classroom environment:

> Population trends make it clear that the schooling of students of diverse backgrounds cannot be seen as an issue to be addressed through special remedial programs

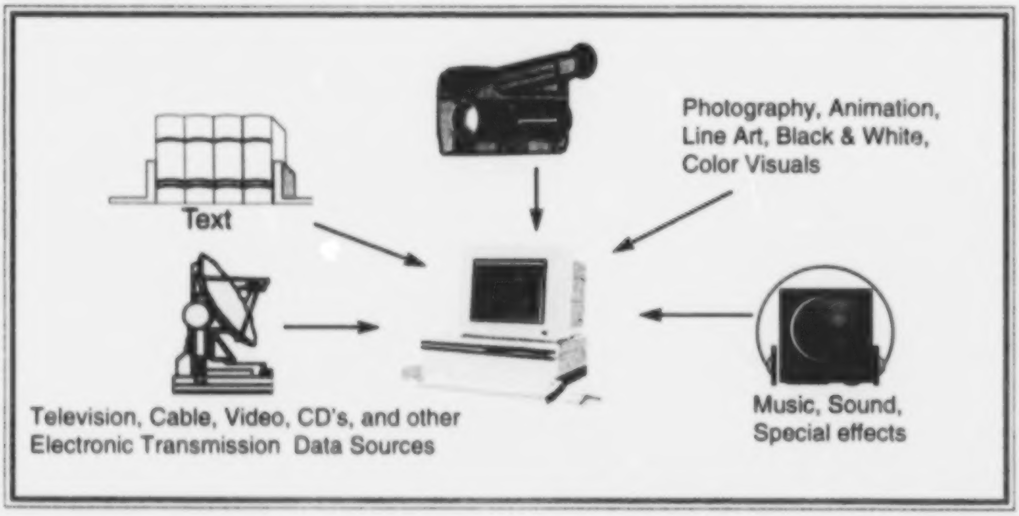

figure 1. Elements of a Computer-Controlled Multimedia Presentation

> that target just a small number of students in each school. Instead, we will need to make major changes in the approaches we use in the regular classroom and throughout the school system as a whole. (p. 3)

Focus of Challenge

In response to this challenge, this paper will: (1) present a brief overview of historical literature on the suggestive powers of visual images in business and education, (2) analyze the influence of audience diversity and biases during the production/selection of visual presentations, (3) consider the delimiting form of new media presentations.

Literature Review

Past research suggests that visual images have the ability to influence the viewers' emotional and physiological responses. Ability, according to *The World Book Dictionary*, emphasizes an inborn talent or existing skill. Its definition reads "the power to do or act . . . the power to do something special."

Graphical images affect how we see and understand ourselves and how we see, understand, and uniquely relate to the environment. Research suggests that images processed by the brain muscle can be internally and/or externally stimulated as proposed by Renate and Geoffrey Caine (1991) in their book titled *Making Connections Teaching and the Human Brain*. In addition, Hodes (1990) found that imagery was a "prominent cognitive process for the retention of information in all learning situations" (p.3). Hodes summarizes mental and visual images as having the ability to act as: (1) facilitator, (2) mediator, and (3) historian. She suggests that images may provide the necessary link between a novice learner and successful completion of a new task.

Visual communicators have historically understood the power of the image to motivate the viewer. However, only in the last decade has research results suggested that visuals themselves are highly biased in their very nature. For example, Berger (1989) writes:

> The first thing we must recognize is that we don't just "see" but have to learn how to see and what to see . . . . and what we decide to see is determined by what we know and what we believe and what we want. (p. 25)

Thus, culture plays a major role in the creation, understanding, and interpretation of visual images for business and education. Houghton and Willows (1987) found that:

> Presenting a picture of an unfamiliar object or animal to a child in a pictorially oriented culture can be educational; but in a context such as an agricultural extension scheme,

> familiarity with the depicted object is basic to understanding. (p. 59)

Effective images are useful in the learning environment because they act as signals to the learner. The learner utilizes effective visuals as clues and cues in the classroom during the learning process. Research suggests that training which includes visualization of material content provides "... significant improvement in teachers' clarity and ability to produce student learning" (Metcalf and Cruickshank, 1991).

Audience Diversity

One picture can hold thousands of individualized interpretations. Current research suggests that a broader awareness of the differences and biases in personalized image-meaning is extremely valuable for multimedia presenters (Au, 1993; Gollnick & Chinn, 1994).

Further research shows television provides major contributions to the bank of visual information available to the masses (Biagi, 1990). For example, studies in the field television suggest that stereotypical images influenced a frequent viewers social understandings more than non-frequent viewer according to Liebert and Sprafkin (1988).

Findings on televised images and the influence on viewers suggest that "individuals who would not otherwise hold the mainstream view but watch a lot of television will be influenced over time, in the direction of moving toward the mainstream" (p. 193).

Moreover, Liebert and Sprafkin after reviewing the work of Huesmann and his associates (1986) found that televised images showed ". . . a clear and significant relationship between exposure to TV violence at age 8 and the seriousness of criminal acts performed by these individuals 22 years later, at age 30." Thus, electronic televised images affect viewers of all ages.

With new media technology, televisions and computers now have the ability to share those same images. In addition, computers, through simulations, allow users access to an environment that models real and imaginary microworlds (Rieber, 1994).

Past research suggests that visuals in computer simulations can also have a positive impact and enhance instruction and the learning process. However, additional findings indicate that visuals can have no effect or may even detract from the learning experience for the user.

Over the years, a wide array of literature has proven the effectiveness of using visuals in presentations. Today's technology takes us even further by opening new avenues and applications. Past research provides a foundation for encouraging graphical images in learning environments. Current research is concerned with how new media images are selected, manipulated, and applied for improved effectiveness and enhancement of learning.

Creation Methods

Although the image-making process is recorded as far back as the pictograph painted on the stone walls of early man, images for institutionalized educational purposes in the United Sates appeared only in the past 300 hundred years (Diringer, 1982). Methods of creating and incorporating visual images into presentations oftentimes required the mastery of various skilled visual artists.

The first illustrated text used for educational purposes in early colonial times included black and white drawings and an illustrated alphabet intended to instruct the young learners of the time. These images were created using the available materials such as plant dyes, inks, and other nature-supplied media.

In contrast, today's electronic image–making and recording consists of positive and negative electron charges recorded in a cathode ray tube. New image rendering software enters the market every month touting better, faster, easier ways to render 2 dimensional and 3 dimensional static and animated text and objects.

Users and creators of visual graphics are no longer bound by traditional methods and labor intensive work. Instead, computer software easily permits electronic manipulation of photographs along with page layouts to users after a short instructional introduction. Illustration programs offer enhancement techniques practiced by skilled artisans and trained specialists.

Computers provide a quick and easy way to produce high quality visuals for business and educational uses. However,new technology holds both advantages and disadvantages.

Advantages

The application for computer-generated images are many and diverse. Electronic images are easily manipulated thus fitting the customized needs of the user. For example one multi-platform software presentation program, PowerPoint, produced by Microsoft Corporation for use in business and education, offers many advantages for both the occasional and advanced presenters.

PowerPoint provides the ability to the multimedia producer of presenting in various modes--black and white, gray-scale, as well as access to a full range 16.7 million colors. In contrast to the traditional methods which utilize pen, paper, and available inks to display information, electronic presentation programs can also prove cost effective in the long run since the presenter often takes on the various production roles. The presenter may adopt the roles of producer, writer, artist, and editor thus maintaining complete control instead of hiring out, thus, cutting expenses.

Other advantages of using new technology for creation and display of visual images include saving production time and energy. Presentation programs frequently provide pre-produced clipart and access to hundreds of images included on compact discs.

CD's containing clipart files are, even for first time users, easily accessed, often with a few clicks of the mouse. If no pre-packaged art is included, drawing tools such as lines, squares, circles, elliptical and specialized shapes and color fills are available along with an assortment of patterns, fills, and gradients to add the necessary elements of visual variety and interest.

Disadvantages

In contrast, new media productions can however prove visually disastrous. As research suggests images are able to (1) enhance, (2) have no effect, or (3) detract from learning. Thus, without the proper training in design principles and awareness of related issues from other fields such as education, new media technology, and visual literacy, computer presentations may have no effect or worse yet harm the viewer's learning experience.

Instruction and training in design principles is essential even for advanced computer users who are now entering the field of visual graphic display and who themselves are motivated by the emotional appeal of images created by current advertising.

Summary

In Hollywood, a good picture holds the power to weave a story, capture the audiences' attention, and provide specific results. The same holds true for today's electronic learning environments utilizing new media production tools and devices. Well-designed images lead, along with practice and the development of production skills, to presentations which generate audience interest and participation, and an enriched learning experience.

High-impact and persuasive images make a difference in the learning environment. As is the case with traditional media presentations, the use of well chosen and placed visual illustrations in multimedia presentations can lead to better productivity and increased effectiveness in the classroom as well as the meeting room (Kupsh & Graves, 1993).

Balance, proportion, unity, and symmetry continue as earmarks of pleasing visual design. Both past and present research also suggest that visual images whether mentally or visually stimulated can lead to an enhanced learning experience particularly for the novice learner when a hands-on learning environment is not available.

What we *see* with our mind is known to be more complex than what we see with our optical sensor, the eye. Research suggests that graphical images can affect the viewer in several ways--positive, negative, and ineffectual. For new media producers, positive results are obtained not only by skill but by sensitivity to such issues as adverse reflection, equal portrayal, along with awareness of target audience's cultural background, gender, and ethnic biases. These issues become major considerations when selecting and designing images for inclusion in computer-controlled new media presentations.

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Two Applied Revisions of a Multimedia Tool: Assessing Attitudes Towards Computer Technology and Cultural Diversity

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Josiah Tlou

At the 1994 International Visual Literacy Association conference in Tempe, AZ the authors presented a progress report on the development and early testing of two applications of a modular multimedia attitude assessment system. Built using a template created in *Authorware*, a dual platform interactive multimedia development tool, these systems employ visuals, audio, and text to discern attitudes and elicit reactions regarding the target areas.

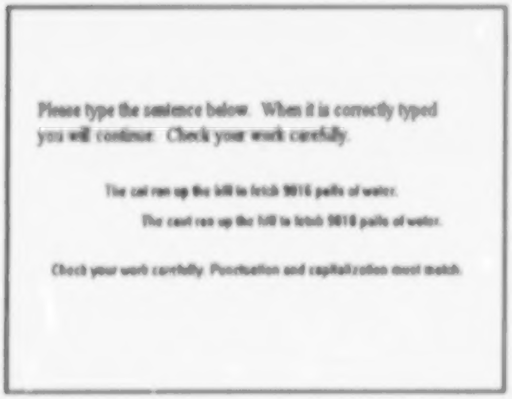
Using multimedia as a means of survey research has many attractive features. Among these are ease of data handling, the ability to provide varied stimuli to respondents, simplicity of modification, and the option to use one template as the base for research instruments in a broad range of areas. The two applications covered in this paper share a concern with assessing attitudes and a generally similar structure, but the presentation, the audio visual resources, and the content of the text stimuli are considerably different.

Assessment of attitudes toward computers

The first application is an evolving instrument which explores educators' attitudes toward the use of technology, especially computers, in school settings. The rationale holds that surveying a group using the tool that is the subject of the survey adds an extra dimension to the interactions and *might* have some effect on the attitudes of participants. A version of this system was introduced at the 1993 IVLA conference in Rochester, NY and described in the proceedings of that conference (Hergert & Holmes, 1994). The feedback from that presentation helped the developers in two subsequent revisions of the program – thereby streamlining the interaction for participants; increasing visual references; improving the scope, content, and efficacy of the provocative statements; and integrating the multimedia resources into a self-contained delivery system.

On beginning the application, users need to know only basic keyboarding and how to move and "click" a computer mouse (see Figures 1 and 2). On-line instructions lead users through the interactions. The system is divided into nine or ten sets of interactions, depending on the version. The majority of information is acquired through a click-and-drag "slider" system that records responses to provocative statements on a Likert scale from Strongly Disagree to Strongly Agree (see Figure 3). In revision three (see Figure 4) the screens contain four still images, four provocative statements, and their attendant sliders. The interactions and their response types are:

1) Acquisition of demographic data (keyboarding)
2) Skills and knowledge test (mouse clicks, keyboarding, and click-and-drag)
3) Initial attitude survey (Likert sliders)
4) Play and watch video vignette 1 (click or operate VCR)
5) Reactions to vignette 1 (Likert sliders)
6) Play and watch video vignette 2 (click or operate VCR)
7) Reactions to vignette 2 (Likert sliders)
8) Exit attitude survey (Likert sliders)
9) Instrument evaluation (Likert sliders–third version only)
10) Instrument evaluation (keyboarding--all versions)



Please type the sentence below. When it is correctly typed you will continue. Check your work carefully.

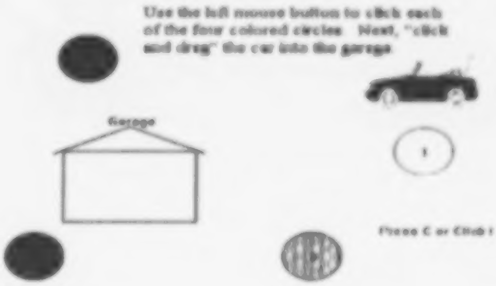
The cat ran up the hill to fetch 9016 pails of water.

The cast ran up the hill to fetch 9018 pails of water.

Check your work carefully. Punctuation and capitalization must match.

Figure 1. Keyboarding (versions 1-3)

The revised instrument (version 2) was first tested in the spring of 1994 with a sample population of elementary school teachers and administrators using the Windows version and a separate video cassette player, displaying the video vignettes in the center of the computer screen. The operation of the video player caused logistical difficulties for a number of respondents. In this first trial it was observed that among the participants who seemed to be least fluid in the physical operation of the computer system, as gauged by time spent on task, there was a positive shift in attitude from the initial survey to the exit survey. This shift was noted and continues as a focus of the study throughout its evolution.



Use the left mouse button to click each of the four colored circles. Next, "click and drag" the car into the garage.

Figure 2. Mouse Skills (versions 1-3)

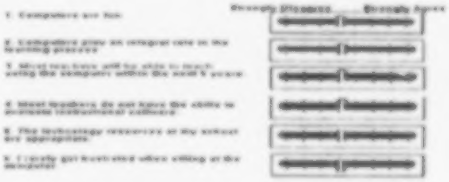


Figure 3. Attitude Survey (versions 1&2)

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The third version of the system was developed on the Macintosh platform in order to exploit its apparent advantages in handling audio visual resources. The provocative statements were revised so that some now address the learning styles of participants. Tested on a sample of 40 educators and university students, version three suggests further adaptations that will be valuable in using the system to assess the attitudes of larger populations.

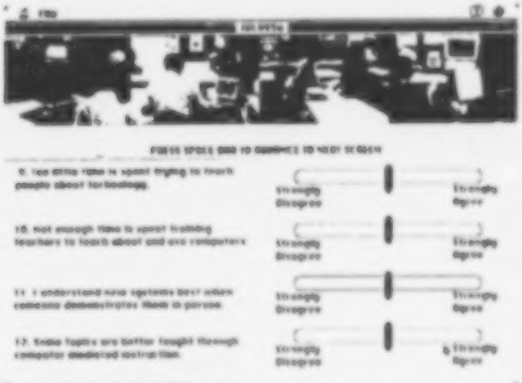

Figure 4. Attitude Survey (version 3)

The Mac version employs QuickTime digital movies and more digitized graphics, integrated into the application and displayed via the computer alone. This choice simplifies the hardware installation of each system and makes it possible to use computers already on-site as delivery mechanisms. Rather than transporting an entire computer system, a video player, and a video monitor to a survey location, small portable hard drives can be attached to most models of Macintosh computers at remote locations, which will then deliver the whole application.

The team plans one more revision for this application which will reflect feedback from both 1993 and 1994 IVLA presentations, reactions from pilot group respondents, and assistance from within our university community. It will be deliverable via both Macintosh and Intel-based platforms, probably using CD-ROMs. The planned version will be employed in projects such as the integration of local public schools into the Blacksburg Electronic Village to assess teacher's and administrator's current attitudes and to aid in planning training and other interventions.

Assessing attitudes and encouraging dialogue on multiculturalism

Visual cues serve as a major determinant in the formation of attitudes -- either positive or negative. Attitudes and beliefs regarding cultural diversity can be influenced by things people see – the cues for preconceptions and prejudices are often visual. Positive learning experiences may serve as one strategy to prevent or combat the formation of such negative attitudes.

One emphasis in designing an effective multicultural learning experience must be the assessment of the evolving attitudes of the persons who might receive such training, first as a diagnostic of the present condition, then as a planning tool for interventions, and a measure of change. Interactive multimedia offers an opportunity to use evocative imagery to illuminate the target attitudes and preconceptions. Automatic data gathering through such systems also increases the value of the tools and their ease of use.

The second application reported in this paper adheres to the above premises in focusing on multicultural education themes regarding cultural pluralism on university campuses. Vignettes from a

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video tape entitled "A Community of Conscience," produced at Virginia Tech, and reported by orientation leaders to have some influence on positively shaping the attitudes of incoming freshmen toward cultural tolerance, are used as primary interventions. The approach stresses teaching strategies and social interactions which affirm the rights of all members of learning communities to be different and emphasize their responsibilities to respect differences.

Showings of the above-mentioned video and subsequent group interactions during freshman orientation have provoked lively discussion and even some epiphanies among participants--students, parents, and faculty. However, the informal nature of the discussions has made recording and accurately reporting reactions, exchanges, and outcomes imprecise at best.

Reuse of the Design

By reusing the design of the first application and repurposing its content, the authors have explored a way to facilitate data acquisition and analysis in systematically addressing some of the issues described above. Practical constraints common to university campuses such as inconvenience, distance, and inaccessibility of target audiences are more easily overcome by these means.

The present modular system allows integration of media developed or chosen by researchers or administrators for specific attributes. Changing media resources can be effected as the presentation opportunities, the target audiences, or the goals of a project evolve. Provocative statements reside in text files that can be created/edited on almost any computer while digital still images and QuickTime digital video scenes can be selected and included relatively easily.

The research team will continue work on this instrument and is actively pursuing other possible applications for this system. Delivery through the Internet will give access to larger and more varied populations, resulting in larger data sets for improved statistical analysis of results. The potential uses of this type of instrument expand as the capabilities of the hardware/software grow.

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Visual Resources on the Internet

William E. Jaber
Feng Hou

Introduction

In the preface of "Visual Literacy" (1993), D. M. Moore & F. M. Dwyer notes that "The study of visuals is a broad and complex mixture of many disciplines, interests, and functions. Scholars interested in the way visuals transmit information, emotion, and data are not limited to any one discipline because of the universal nature of images. " (p ix). "By the very nature of this diverse subject," the authors continue to note that "there is necessarily a wide variety of interests and perspectives on the topic." (p ix). Visual resources on the **Internet** which have been developed by the major educational and scientific institutions as well as by business industries have recently aroused much interest among educators, scientists, businessmen, and the general public and have revealed great potential for educational research and instruction.

With the development of the Internet technology and proliferation of the network application, visual materials which include paintings, drawings, charts, photographs, computer graphics, and even animations and motion pictures, etc. have been digitized and archived on many computer servers on the Internet which are publicly accessible. However, these visual resources can be beneficial to us as educators only when we realize what they are, what they look like, what format they are created, and how they can be used for instructional purposes. The purpose of this presentation is to demonstrate: (1) the richness and diversity of the visual resources on the Internet, (2) the major categories of the visual resources, (3) characteristics of the visual resources, (4) the popular format in which they have been created and archived, (5) common accesses to the resources on the Internet; and (6) pilot projects of how visual resources are used in the classroom for instructional purposes

Internet

Dan Van Belleghem, who helps connect organizations to the Internet for the National Science Foundation, says, "Nobody has ever dropped of the network. Once they get on they get hooked. " (Krol, 1993) What is so magical about the Internet? How can we navigate this information superhighway to find the visual resources we are interested?

The Internet was originally developed in 1969 by the Pentagon as the **ARPANET** (Advanced Research Projects Agency), a computer networking project, to transmit packets of military data securely and efficiently around the world. In 1984, the National Science Foundation began building five supercomputers around the country for conducting scientific research. When Defense Department researchers wanted access to the supercomputers as well, the **N.S.F.** linked them up with **MPANET**. The popularity of computer access, especially to collaborate on-line, has steadily expanded ever since.

Technically, the Internet is the world's largest collection of decentralized computer networks, with over 30,000 computer networks connecting more than 1.5 million computers to one another using the high-speed **TCP/IP** telecommunications protocol. Through the Internet, at least 15 million people in over 200 countries send and receive **e-mail**, engage in thousands of discussion groups, conduct research and development projects, and utilize a wide array of public and private information services. The Internet is the fastest growing telecommunications network, with a growth rate of nearly 10% per month as of mid-1993.

What makes the Internet unique is that it is a two-way communications medium. It gives users the ability to respond immediately, and select information services or contact suppliers of goods and services. The Internet will succeed where other mass marketing information systems have failed because access to it is ubiquitous and well-defined.

Everything from the complete works of Shakespeare to the pictures of Clinton's inauguration, and the number of sodas in a Coke machine at Carnegie-Mellon University is accessible. The primary use of the Net is for communication, however. "Half the traffic on the Internet is e-mail at this point," says Mandel. The number of topics on the newsgroups can be daunting. Today, users can talk to one another, send e-mail back and forth, join arcane discussion groups, tap into libraries in universities from Berkeley to Bern and exchange almost any sort of data, including pictures, sound and text. Recently, a cult movie called "Wax" was broadcast to Internet sites all around the country. While it was black and white and only two frames per second, it was an important first step toward the computer equivalent of cable broadcasting. Also, a radio program is already broadcast weekly on the Net, complete with technology news and a "Geek of the Week" segment.

Some interesting data about the Internet:

1. More than 1.5 million computer systems including mainframe, mini computer and microcomputer of various platforms around the whole world are connected to the Internet

2. Up to 15 million people in more than 200 countries have the access to the Internet in one way or the other

3. The number of computers linked to the Internet has doubled every year between 1988 and 1992

4. In 1993, the increase rate slowed slightly but still reached up to 80 percent

5. More than 2500 subjects are being actively discussed over the Internet

Visual Resources

Visual resources on the Internet are the digital images (e.g. pictures, animations, etc.) which can be visually perceived or the verbal information which discuss about the visual resource archives and explain the ways of how to perceive and appreciate visual images; their fundamental function is for educational, scientific, and entertainment purposes and they are archived in the form of electronic data on the computers which are connected to the Internet. According to R. A. Braden (1993, "Visual Literacy", D. M. Moore, et a la, p 193), visual resources are categorized in several ways, "they can be classified according to the end purposes: educational, promotional, entertainment, art".

Visual resources on the Internet are prolific in volume, rich in subjects, and diverse in formats. The major characteristic of the visual resources on the Internet are that they are: (1) digital; (2) interactive; and (3) manipulative. In the simplest sense, they can be classified into three major categories: 1) still images; 2) motion pictures; and 3) Internet news and discussion groups. There are also many other ways to categorize the visual resources. Most common ways of categorization include: 1. by subjects, such as digital virtual reality, scientific research, art and humanity, etc.; 2. by specific topic, such as Congress Library's Exhibits of 1492-An On-going Voyage, Scrolling the Dead Sea, and Vatican Exhibit, etc.; 3. by computer databases, such as Smithsonian Photol and Strange Interaction database at University of Illinois; 4. by the image file formats, the most commonly seen formats for the still images on the Internet include **GIF**, **BMP**, **TIF**, **JPG**, etc. while the formats for motion pictures are normally **MPG** for both PC and Macintosh and Quicktime movies for Macintosh. News and discussion groups on the Internet, however, generally refer to OK **Bitnet** listserv discussion groups, **Usenet** Newsgroups, local **BBS**, and **Gopher** and **WAIS** databases.

Netiquette for Using Visual Resources on the Internet:

Netiquette is a combination of two words. Net from Internet and etiquette. Thus we get netiquette meaning etiquette on the Internet. The Internet was developed initially to share military data, conduct scientific research and collaborate on-line. There is no charge and no governing body for the use of the Internet. Basically there are no rules for use, no one to answer to, because of this there are abuses of the privilege of using the Internet. Some of those abuses are: (1) illegally storing and transferring copyrighted material, (2) flaming users for their lack of knowledge or mistakes, (3) storing and transferring pornographic material, and (4) electronic stalking of children.

The last two has made news several times in the last several months. Talab (1994) states "A sex-related discussion group, known as a news group, exchanges child pornography via the Internet." While these two may not involve copyright penalties, they do involve criminal penalties.

Care should be exercised when downloading and using files. Probably the first rule to use in downloading files is use only major sites. Sites such as major educational institutions, NASA and the Smithsonian will have files which have legally been placed on servers for Internet use.

Some sites may not have the legal right to place pictures and other works on the Internet. If you are in doubt, get permission to use a picture. You could be held legally responsible for not obtaining those rights.

The Internet user is not invisible to other users. Your e-mail or other works could be stripped of headers and signatures and sent to someone else or large groups of people. Care should be used in making responses to and about others on the Internet. More than a few individuals have wished that they had been more careful in their responses on the Internet. Flaming, abusive and highly critical remarks made to others for mistakes that they make in using the Internet, is also improper conduct. Many network administrators will revoke privileges if proper conduct and consideration is not used.

There has been a proliferation of pornographic pictures placed on the Internet. Many of these pictures deal with subjects who are minors. In some countries these images are legal but in this country you could find yourself in serious legal trouble. Recently in national reports, individuals have been arrested for downloading such files. Be careful of what you download and how you use it. Someone may be watching you.

Another similar area has been "electronic stalking" of children. This usually occurs on K-12 bulletin boards. Children are at first engaged in conversation which turns to sexual contexts. Individuals then try to set up a meeting with these children for sexual purposes.

In a resent telecast, a man flew to Florida to meet a young boy for a sexual encounter. He was arrested at the airport when he arrived. He had been communicating with a police officer. Police departments are beginning to establish divisions to keep watch and monitor electronic activity involving minors.

Use of Internet resources requires responsible conduct by those individuals using the Internet. Without responsible conduct and adhering to the intent of the Internet, we may see government intervention and censorship. Remember proper etiquette and ethics especially in making responses, e-mail communication and downloading and using files will continue the success of the Internet..

Some Problems in Using Visual Resources on the Internet:

Unfortunately, just because the Internet is a decentralized global computer network, the visual resources available on the Internet are very disorganized, which is partly the reason of this project. Another problem is that some visual resources that were available on the Net one day could be gone the next. There are many reasons for this, but two of the most common are computer redeployment and over utilization.

The other problem driving resources away is the success of the Internet itself. If 1% of the Internet users used a resource daily five years ago, there'd be about 100 uses per day. If that same percentage holds today, there could be as many as 100,000 uses per day. Suddenly, the background service being offered eats up so much of the machine that the machine's primary reason for existence can no longer be accomplished and the service is turned off.

For the new user, "persistence" is the key word. When you are trying to use the Internet, especially for the first few times, you may be unsuccessful in making connections. This leaves the user with a feeling of frustration and failure. There are several reasons for this: the time of the day or the amount of usage.

Depending on the time of day that you try to access a site you may not be able to get connected. This is due to servers being busy, other people are connected. If you keep trying you can eventually get connected. Keep in mind what time zone the site is that you are trying to access.

Another reason for not being able to connect to a site is that the host computer may have been shut down. It could be that site received more use than was planned by those maintaining the site or financial costs made it impossible to keep the host on-line.

You never know from day to day if a site will be active. You may access a site today and tomorrow the site is no longer active. There could also be technical problems that could keep a site inactive. You have to keep trying different sites, so don't be discouraged.

Mosaic

NCSA Mosaic, an information browser developed at the National Center for Supercomputing Applications. This document is an interactive hypermedia tour of Mosaic's capabilities.

Mosaic is an Internet-based global hypermedia browser that allows you to discover, retrieve, and display documents and data from all over the Internet. Mosaic is part of the World Wide Web project, a distributed hypermedia environment originated at CERN and collaborated upon by a large, informal, and international design and development team. Mosaic helps you explore a huge and rapidly expanding universe of information and gives you powerful new capabilities for interacting with information.

General Rules of Using the Internet Visual Resources

Visual resources on the Internet including still images, motion pictures, regardless of format, and some articles posted on the news and discussion groups may be covered by restrictions, and/or copyright. They are available only for non-commercial, personal use. Copying or redistribution in any manner for personal or corporate gain is not permitted.

Users can download these resource files for their own use, but they are subject to any additional terms or restrictions which may be provided with the individual file or program. There's no charge for the user, but when downloading visual files for the relocation purposes, all the accompanying text information (accompanying ASCII text caption files contained on the source server) must be included, and must be presented completely and unchanged.

In general, any use of the Internet visual resources for academic purposes is encouraged, but the permissions should be obtained from the producer or owner if the visual resources are going to be published. Permission for such use is normally granted on a case-by-case basis. Some people or organizations may charge a certain amount of fee for the process depending on the type and nature of the proposed use.

Conclusion

This is only an initial effort to help individuals to become aware of the visual resources on the Internet, to explore those visual resources archived on the Internet, to record the Internet sites as well as downloading files from those sites. It is also our desire to provide more application examples which employ the visual resources on the Internet for the instructional purposes.

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Appendix A

* Terms as defined in the Microsoft Windows Reference Manual, The Whole Internet, Microsoft Windows User's Guide, and Adobe Photoshop User Guide

ARPAnet

a computer networking project, to transmit packets of military data securely and efficiently around the world. It is not in existence today.

BBS

stands for Bulletin Board System. The BBS allows individuals to chat with other users, to view bulletins and share information and files.

BMP

stands for bitmap. It is an image stored as a pattern of dots (or screen pixels).

Bitnet

(Because It's Time NETwork) allows data to be transferred between educational and research institutions

e-mail

shortened form of electronic mail. It is a way of sending mail around the world within a matter of seconds by using the Internet

ftp

or file transfer protocol, defines how files are sent from one computer to another regardless of what platform the two computers are operating (i.e. PC to MAC)

GIF

Graphics Interchange Format is CompuServe's file format for passing files between other types of computers

Gopher

a menu-based lookup tool for exploring Internet resources. You don't have to know the IP address or domain name. You find it in the Gopher resources and select it. Gopher then "goes fer" it.

IP

This is the Internet Protocol. It is the most important protocol on which the Internet is based. It allows a packet to traverse multiple networks on the way to its final destination.

Internet

The Internet is a world-wide network of networks comprised of about 30,000 computer networks

JPG

JPG -- Joint Photographic Experts Group. ISO/CCITT standard for compressing images using discrete cosine transform. Provides LOUSY compression which means the sharpness from the original images will be lost

Major advantage:

It provides a compression ratios of 100:1 and higher which greatly reduce the size of a digitized graphic image. The more the loss can be tolerated, the more the image can be compressed

JPEG uses the JPEG File Interchange Format, or JFIF. File extensions are .JPG or .JFF. MPEG is the JPEG counterpart for full-motion digital video. (See "Popular Video/Animation File Formats on the Internet")

MPG

MPEG/MPG MPEG -- Motion Picture Expert Group

MPEG is a video compression algorithm which reduces the size of a digitized video file but still can play it in nearly real time mode.

Three types of coded frames: "I" or intra frames which are simply a frame coded as a still image, not using any past history; "P" or predicted frames, which are predicted from the most recently reconstructed I or P frame in terms of decompression; and lastly, "B" or bi-directional frames, which are predicted from the closest two I or P frames, one in the past and one in the future.

Many different versions of MPEG decoders for both DOS and Microsoft Windows which can handle I, P, and B frames and play the MPG format movie files. Some of the Window MPEG player programs such as XingIt supports OLE.

Mosaic

an information browser developed at the National Center for Supercomputing Applications. Mosaic is an Internet-based global hypermedia browser that allows you to discover, retrieve, and display documents and data from all over the Internet.

N.S.F.

National Science Foundation

packet

a bundle of data varying in size from 40 to 32000 bytes

PICT

This file format is widely used by Macintosh graphics and page layout applications. It allows files to be transferred between applications.

protocol

is how computers will act when talking to each other.

TCP

The Transmission Control Protocol. One of the protocols on which the Internet is based.

TIFF

stands for Tagged Image Format. It is another way that images may be stored. It allows for file transfers between different applications and different computer platforms.

Usenet

an informal group of systems that exchange "news."

WAIS

stands for Wide-area information servers. This is a very powerful system for looking up information in databases across the Internet.

WWW

World Wide Web. A hypertext-based system for finding and accessing Internet resources.

Appendix B
Hotlist of the Visual Resources on the Internet

Still Images:

http://www.hcc.hawaii.edu/dinos/dinos.1.html
http://www.tig.com/IBC/AfterHours.html
http://www.well.com/Community/Jaron.Lanier/art.html
http://www.einet.net/galaxy/Arts-and-Humanities/Visual-Arts.html
http://marvel.stsci.edu/wfpc2-images.html
ftp://amanda.physics.wisc.edu:/pub/art/
http://siggraph.org
http://gnn.com/ora/
http://InforMNs.k12.mn.us/rfe/chukotka
gopher://groundhog.sprl.umich.edu
http://meteora.ucsd.edu/~norman/paris/
http://www.atmos.uiuc.edu/weather/weather.html
http://www.atmos.uiuc.edu/wxworld/html/general.html
http://metaverse.com/vibe/
http://olt.et.tudelft.nl/fun/pictures/pictures.html
gopher://gopher.panix.com/11/nyart
http://www.cs.colorado.edu/htbin/grepitp
http://www.ncsa.uiuc.edu/DigLib/prototype/Black-Hole-Spacetime-Anninos.html

Digitized Video/Animation:

http://force.stwing.upenn.edu:8001/~jruspini/starwars.html
http://metaverse.com/knet/
http://archpropplan.auckland.ac.nz/People/Mat/gallery/animations.html
http://www.rpi.edu/Internet/Guides/decemj/internet-cmc.html

Usenet News Group:

news:news.art.com
http://web.cnam.fr/Images/Usenet/
http://www.cis.ohio-state.edu/hypertext/faq/usenet/graphics/top.html

General Information:

http://nearnet.gnn.com/GN-ORA.html
http://cui_www.unige.ch/OSG/MultimediaInfo/index.html
http://www.rpi.edu/Internet/Guides/decem
http://metaverse.com/space/index.html
http://www.well.com/Community/index.html
http://wings.buffalo.edu/contest/awards/index.html

Developing Hypermediated, Videodisc Training for Child Welfare Personnel: Bringing Visually Rich Training to Rural Areas

Nancy Nelson Knupfer

Rural areas are blessed with many advantages, but access to professional development activities is limited. Like other professionals, child welfare workers need access to further skill and career development. Professional development activities for child welfare workers generally lead to better services for the children and their families. For child welfare workers in rural areas, opportunities for professional development usually require the time and expense of traveling to a central site to participate in training at a specific time. This can mean spending one day at a workshop, but with an extra day for traveling tacked on before and after the workshop, there is the potential of being away from the office for a least part of three continuous days.

Distance education has become an increasingly popular form of continued education and training for adult audiences in rural settings. One solution to providing access to further professional development is to offer course work at the rural worker's own site. Multimediated courses offered at their own work site and according to their own schedule can provide a solution to professional develop for rural workers.

The increasing workplace demands on social workers require a feasible solution to providing in-service training for those who reside in rural areas. Social workers need to know more information, yet increased responsibilities make it difficult to leave the office. While distance learning opportunities have multiplied greatly in the past several years, the lack of relevant course work and access to the technology necessary to participate in these opportunities may prohibit the wide use of distance education for rural social workers.

In a rural, midwestern state, two major institutions identified specific training needs for child welfare workers and set a five-year plan to meet them. The training plan calls for design and development of highly visual multimedia instructional units that can be transported to rural areas and used independently. The end result is a unique and visually powerful product that serves training needs in a rural area and provides continuing education credits toward career advancement.

The increased capability and availability of computers for education has led to questions about the potential applications and impact of this medium on the teaching and learning process. The design of visual images can greatly promote or interfere with learning. Image design needs to consider several variables including, but not limited to, the audience and intended message, along with the medium and technological constraints.

When learners use computers on a local basis, they have opportunities to interact with the program. This interaction enables each learner to control the pace, length of a session, and path through the program (Jonassen, 1988). Distance education offers the ability to reach a larger range of students, but the technology often limits the type of interactive possibilities. Placing the multimedia at the distant site overcomes the technological barriers commonly associated with distance learning while offering all of the advantages of local instructional with the exception of ready access to an instructor.

Ongoing improvements in computer hardware and software have removed some of the former technological barriers and now computers can supplement text with colorful graphics in both static and dynamic modes. Computer-controlled multimedia presentations can display images that are either digitized such as those on CD-ROM, or analog format such as those played from a videodisc. Some equipment even allows a mix of both analog video and digital displays on the same screen.

Because computer and television screens contain similarities, there are some design considerations that are common to both media. Presentations that mix images from a computer with images from a videodisc, television camera, or other projected image generally follow the rules of televised video screen design with some special consideration for the computer-based medium. This paper addresses some design considerations for computer-produced visual displays that are intended for either local or distant audiences. It assumes that electronically-produced instructional images require different design considerations than those that are limited to print.

The project as a whole is called ***Building Family Foundations*** because its general goal, like that of the current social assistance programs, is family preservation. The five-year project expects to design and produce ten different modules of instruction each carrying three continuing education units from Kansas State University. The following lists highlight in brief form the main considerations of the project design.

Ten Courses In This Project

- Child Development
- Family Issues - Separation and Attachment
- Family Based Treatment Strategies
- Legal Issues and Court Procedures
- Professional Ethics
- Practice Skills I
- Practice Skills II
- Stress Management
- Abuse and Neglect
- Adolescents

DESIGN CONSIDERATIONS

There are numerous items to consider when designing a large project like this. Areas of special consideration to this project were some background information about the audience, the way that the modules would be used, product components requiring design and production, record keeping so that social workers could get credit for completion, screen design that optimizes desirable features within the limitations of our production capability, logical progression of movement throughout the program, production organization and tasks, planning and preproduction tasks, special features of the multimedia, and video format.

Who is the Audience?

- Background information
- General educational level
- Range of computer skill level
- Environment for using this training

How Should the Modules be Used?

- Independently in any order
- No prerequisites
- With accompanying workbook

Module Product Components

- Videodisc
- Computer Program on Hard Disk
- Computer Disk for Personal Record
- Workbook Documentation

Features

- Glossary
- Hot Words
- Content Map
- Individual Record of Progress
- Ability to Print Record Sheet and Score
- Bookmark so Learners Can Take a Break and Come Back
- Workbook Documentation in 3-Ring Binder for Easy Access to Pages. Some pages may be xeroxed and used with clients.

Screen Design

- Use Colors with Care and Purpose
- Visual Theme Throughout is Shapes
- Visual effect of Depth and Patterns
- Special Effects Used Only When They Add to the Instructional Purpose
- Layout and Font Legibility

Movement Logical Flow

- Learning Objectives Must Be Developed Prior to Content
- Path must create logical choices and allow learner control
- Transitions are Crucial
- Prerequisites Identified Early in Design

Team Approach

- Overlap Duties
- Instructional Designer
- Scriptwriter
- Graphic Artist
- Videographer, Standard Production
- Videographer, Special Effects
- Programmer
- Planning and Preproduction Tasks are the Majority of the Effort

Features

- Verbatim Option for Those Who Wish to Read the Text
- See Words or Review Audio
- Hot Words
- Content Map
- Workbook Reference

Video Master Tape Format

- Use of SVHS Video Master
- Is it Sufficiently Good Quality?
- Saves Money

INFORMATION DISPLAY

Information display can be organized into three perspectives within the image: structure, meaning, and impact of the image (see Figure 1). The structure of the image contains the essential elements of good screen design. These elements can enhance the learner's ability to perceive and interpret the intended message. This leads to the learner's ability to apply meaning within the given context. Finally, images add impact to text-based messages; they have the potential to both clarify the message and add emotional impact.

Structure Of The Image

The structure of the image first considers the visual as a whole, then its components and the elements of good screen design. In order for the various image components to work together, elements of well-planned screen design must weave the components together in an aesthetically pleasing and understandable format. Thus, one must consider both the image and the screen design.

The Image

The image contains a mix of components that can work together or separately to modify the intended message. As you read this section, try to visualize the possible image variations that result from influences such as text, color, graphics, animation, and multimedia.

Text. Since text dominates computer-based instruction (Soulier, 1988), it is important to design text displays that communicate clearly to the reader. With appropriate fonts and spacing, computer screens can work very well for presenting limited amounts of text. Large amounts of text work better in printed form (Soulier, 1988) since they induce eye fatigue (Hathaway, 1984; Mourant, Lakshmanan, & Chantadisai, 1981) and are likely to be forgotten when presented on the screen (Wager & Gagne, 1988).

In addition to the amount of text, its density, along with typographic cueing and the mix of upper-case and lower-case characters can affect legibility (Hartley, 1987; Hathaway, 1984; Morrison, Ross, & O'Dell, 1988; Ross, Morrison, & O'Dell, 1988). Variations in font type, size, and density along with direction and screen placement can add meaning to the text image. See how the word "perspective" has been used in Figure 2 to actually suggest the feeling of visual perspective. Attention to font variation gives the feeling of With the exception of titles, headings, or special effects, the text should contain a mix of upper and lower case letters.

No matter what the screen design, legible text requires an appropriate font that is properly spaced. There is disagreement about the appropriateness of serif or sans serif style fonts. Some authors claim that fonts with serifs, as opposed to block-style lettering, are a better choice for computer screens (Soulier, 1988). Yet others believe that sans serif fonts with proportional spacing provide a cleaner effect that is easier to read than their seriffed counterparts (Gibson & Mayta, 1992; Kemp & Dayton, 1985). Fonts with small serifs can add interest to the display, while elaborately-seriffed fonts are difficult to read, especially if the image is to be viewed on television or in a large room.

Text legibility also depends upon the point size of the font. The point size of text on a computer screen can range from 12 to over 100 points per inch and remain legible. However one should consider the intended usage when selecting point size. Images that are likely to be projected for large audience reading should not use a point size smaller than 26 (Gibson & Mayta, 1992) and images that are not likely to be projected or broadcast will seldom require an extremely large font. Also consider the user; when designing screens for young children or people with visual impairments, use a larger font.

Figure 1. *Effective Instructional Images*

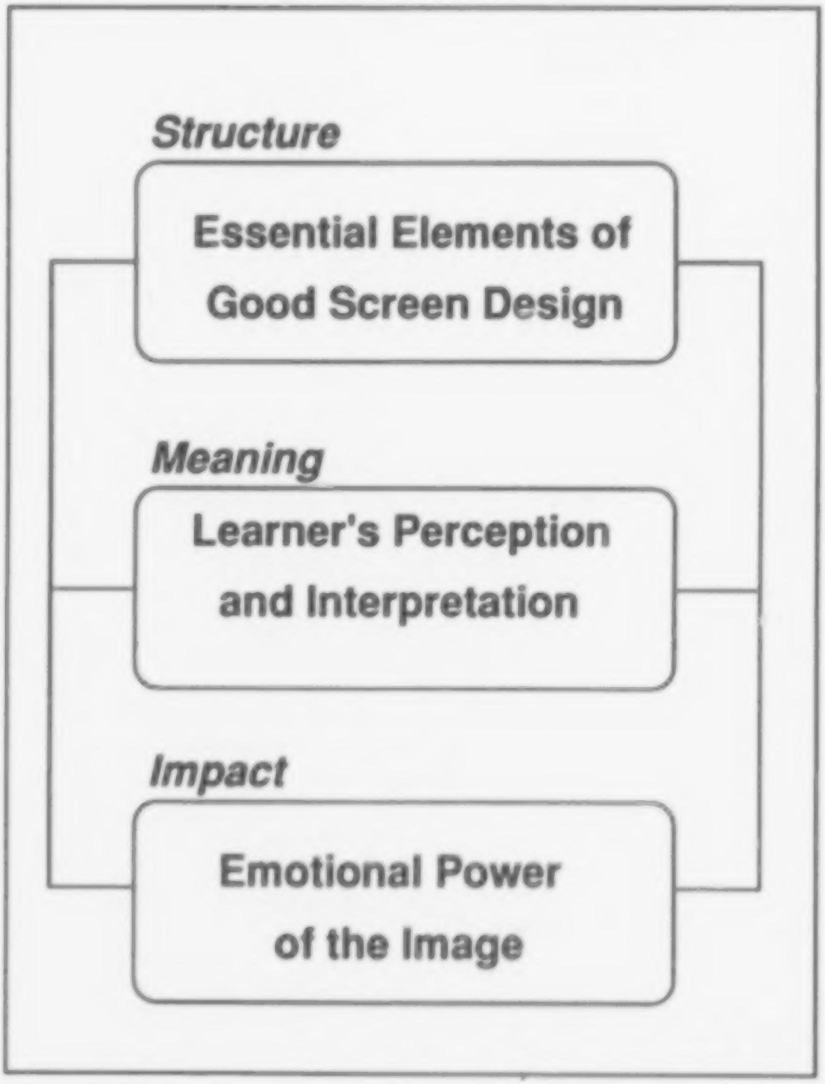
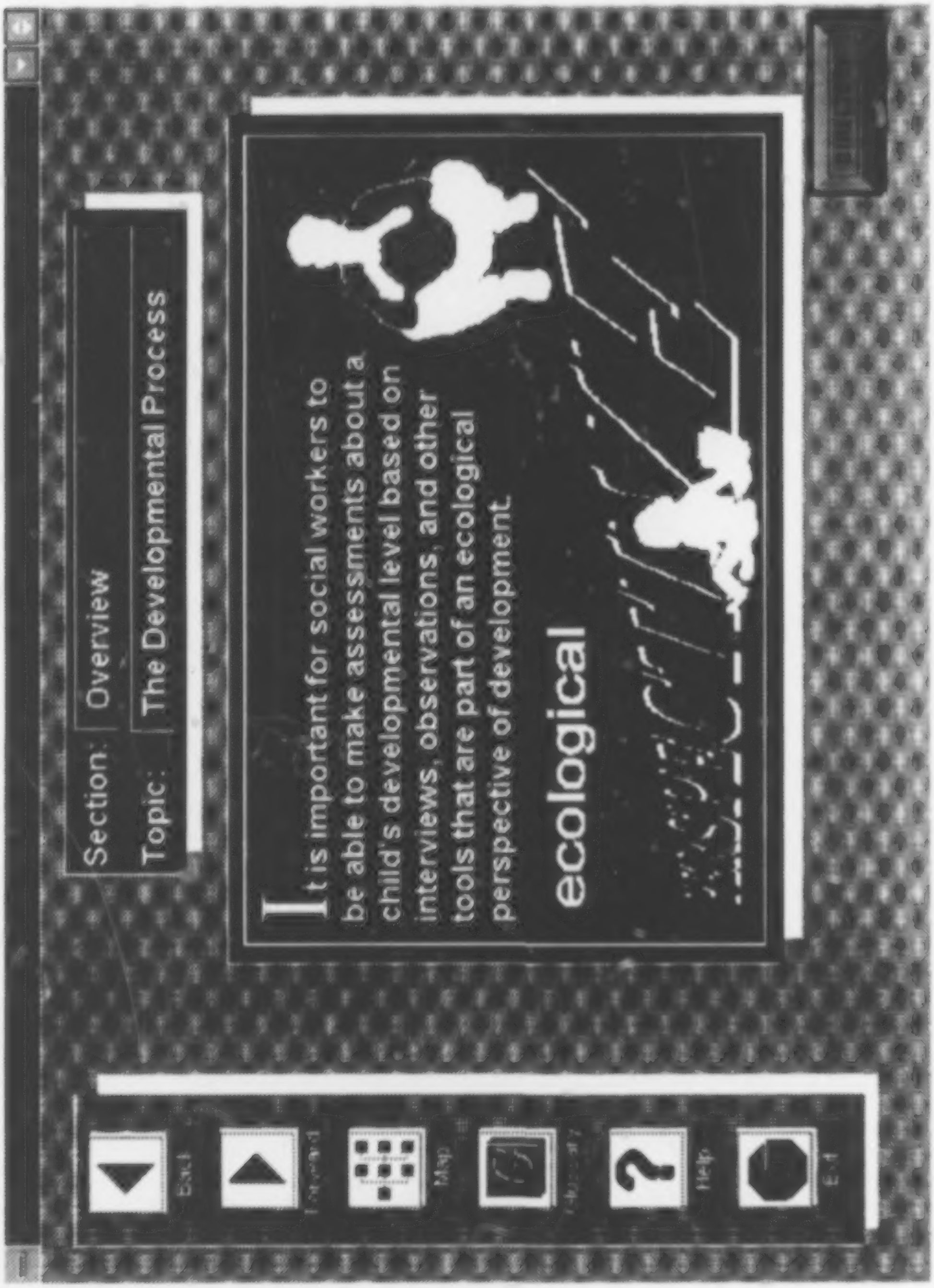

Structure
Essential Elements of Good Screen Design
Meaning
Learner's Perception and Interpretation
Impact
Emotional Power of the Image

Figure 2. *Font Variation*



Section: Overview

Topic: The Developmental Process

It is important for social workers to be able to make assessments about a child's developmental level based on interviews, observations, and other tools that are part of an ecological perspective of development.

ecological

BEST COPY AVAILABLE

In addition to style and size of the font, the weight of the typeface, line length, phrasing, and spacing between lines of text affect the legibility of computer screens. The weight of a font can vary from light, narrow, fine lines to heavy, broad, bold lines. A medium to bold weight is very good, depending upon the mix of elements on the screen. Gibson and Mayta (1992) recommend that bold typeface be used throughout all computerized screen images that are intended for broadcast so that the text shows up against the graphics. At the least bold fonts should be used for all titles and headings as well as for particular words that need emphasis. Drop shadows behind the text characters can add legibility if used carefully.

Because computers, monitors, software, and projection systems are becoming more capable, perhaps it is not as critical to adhere precisely to recommendations about font style and weight as it was in the past. An important contributing factor is the availability of good resolution provided by a VGA monitor and a quality projection device. Also, color can be provide visual cues within the text.

Color. Colors can be soft, harsh, or various combinations in between. Most of the computer software I have seen uses the palette of strong colors contrasts that are standardly available within computer presentation software. Our project team includes a graphic artist who looks for softer color mixes that use more subtle tones. These mixtures are very interesting and pleasant to look at.

Specific educational objectives can be enhanced by using color in visual illustrations (Dwyer, 1978), but while a few colors can cue the learner about the intended message, too many colors can be confusing. Color should assist the user in focusing on the material; it should never be a distraction (Gibson & Mayta, 1992). Accordingly, Hannafin and Peck (1988) suggest using a bright color to cue the learner for new information, while presenting the remainder of the information in standard colors consistent with the rest of the screen. Soulier (1988) recommends checking the program on a monochrome monitor and using a pattern as a backup technique to aid those people who are color blind.

The **Building Family Foundations** courseware uses color coding extensively. The actual variety of colors is limited, but the specific uses of color cue the learners to the meaning or function of specific screen objects.

A few colors with good contrast values will show up well on both color or monochrome displays, but an extreme contrast like stark white on a black background will cause bleeding and illegibility; it is better to use light grey to achieve the desired effect. Also avoid high values of red and orange because they can bleed into the surrounding colors.

In addition, certain colors that look ideal on an individual computer screen tend to flare or wash out when they are projected to a large screen or transmitted over a distance. To avoid disappointment it is best to experiment with a few color combinations using the equipment that will support the image when it is actually projected. Complementary colors with low saturation would have a good chance of working.

Graphics. Graphics add interest to the screen by providing visual variety (Kemp & Dayton, 1985) and offer another opportunity to suggest meaning to the learner. Possible graphic treatments range from simple to complex, from small monochromatic embellishments to dramatic, richly-colored, full-motion video images complete with sound effects.

Like verbal metaphors, visual metaphors can help us to understand an unfamiliar concept. Metaphoric graphics (Soulier, 1988) may be used to clarify a meaning within the computerized message, or they can guide the user through the mechanics or functionality of using the software. For example, standard icons can symbolize the functionality of the software features and lesson flow.

Graphs that display data depend upon the reader's thought processing, interpretation, and comprehension; to be effective they must consider the intended visual message carefully. Sophisticated graphic displays that are designed to suggest inferences, generalizations, and evaluative interpretation can help students interpret meaning (Reinking, 1986; Singer & Donlan, 1980). High-level instructional graphics, such as symbolic, schematic, or figurative displays can be effective in teaching, and the visualization of abstract ideas through figurative displays may very well enhance learning (Nygard & Ranganathan, 1983). All graphics do not require the same level of detail and clarity, but even simple, decorative graphics at the pictorial level have their place. Indeed, Boyle (1986) suggests a need for designers to address cognitive processes by developing more materials for graphic thinkers, not just graphic readers.

This project uses graphics where possible. For example, to portray the normal growth and development of boys and girls at a variety of ages, the reader can select the gender and age, and then the computer displays the range of height and weight that is within the norm.

To assist with designing computer graphics, Soulier (1988) offers the following guidelines: keep illustrations appropriate for the audience; use simple line drawings when possible; preload graphics into the program so that they appear quickly on the screen; use standard symbols and symbolic representations; and keep graphics on the same screen in close proximity to the corresponding text message. These few tips can greatly improve the aesthetic appeal of a graphic and promote clarity of the message.

Most development software allows the use of simple animation to illustrate a motion, provide interest, or draw attention to particular areas of the screen (Kemp and Dayton, 1985). Although it is tempting to embellish the graphic, it is important to use animations only when appropriate and keep them short (Soulier, 1988).

This project uses a few well-placed animations that will aid the learner's comprehension of the material by, for example, gaining attention or illustrating a concept. When used sparingly animations can be effective, but they can become irritating, distracting, or disruptive to the thought process if overused or left on too long.

Screen Design

Good screen design aids the learner by using visual components to portray the message in a way that provides both clarification of information and visual interpretation. To visually aid the learner, it is necessary to consider the specific elements of good screen design as well as the general screen layout.

Elements of Good Screen Design. Interesting screens are composed of a variety of elements that work well together. Many of these elements are equally important so they are presented here in no particular order. The goal of good screen design is to use the various elements together to compose a simple, consistent design that provides sufficient information while avoiding clutter.

Unlike printed material which can be skimmed at will, the computer screen limits the learner's view of the overall content. Screen designs that are simple, straight forward, and consistent can help lead learners through the material, while complicated designs can lead to frustration. The basic simplicity of frame layout and user options does not restrict the ability to add interest and meaning with a full range of simple and complex graphics.

Certain user options should always be available. For example, status lines at the top or bottom of the screen that contain consistent information help the learner assess progress and maintain some control over the program direction. The reader should control the display rate when possible so that there is adequate time to read the text, interpret the graphics, and consider the meaning of the message.

Menus should be clear, concise, uncluttered, and consistent. Icons within menus can be very helpful if the meaning of the icon is readily apparent. The range of possible choices in some programs can lead to cluttered or excessively layered menus; pull-down menus can be a solution. Highlighting or fading some menu choices will quickly give a visual cue about which items are currently available.

Ross and Morrison (1988) suggest using a hierarchical text display that is vertical and uses indentations similar to an outline. They further recommend a low-density text display with reduced wording and sentences limited to one main idea. It it also important to use care when splitting lines so that phrases remain complete Soulier (1988). Personal preference varies concerning single or double spacing of text, but do provide text breaks where the content allows.

In addition to font size, the text legibility is influenced by contrast with the background. Common considerations for both computer screens and video images suggest cool, neutral background colors like grey or blue instead of bright, very light, or very dark backgrounds. Tasteful use of enhancements such as outlining, inversed, or drop shadowed text can add to legibility.

Special techniques for changing the screen display, such as zooming, panning, tilting, and wiping onto the screen, can vary the viewer's perspective of the image. For example, a section of the screen can be enlarged to give a close-up view of specific details. Or the image can change from a long shot displayed in a small part of the screen to an extreme close-up showing part of the same image displayed in full screen mode. This technique can give the learner the sense of moving in to take a close look at the image. Imagine, for example, the visual effect of looking at a long shot of a group of trees in a small box on the screen and then changing to a full screen display of a close-up shot of leaf on one of those trees.

Screen Layout. The elements of good screen design work together to build a cohesive screen layout. The computer screen layout should never be visualized as a printed page filled with text, but guidelines similar to those offered for desktop published materials can be helpful. These include balancing text with white space, improving the aesthetics of the page, and positioning graphics as the dominant visual element (Parker, 1987). Designing the display with attention to legibility, the purpose of the particular frame, and consistent protocol, can result in visually interesting computer screens.

Like silence within oral communication, empty spaces can be used to advantage on the computer screen. For example the screen can be used to organize or highlight information, to draw attention to particular parts of the frame. The mix of graphics and text can provide a visual cue; so can boxing and grouping of information. Partitions, borders, standard icons, and consistent placement of common elements will visually aid the reader.

Generally headings are centered and bold, sometimes even boxed. For long or complicated sequences, subheadings can be used that include numbers or roman numerals to aid the reader in visually following the general flow of information. As a general rule, information should flow from the top, left part of the screen to the bottom, right part of the screen because that is the way people in our culture read.

Good layout technique depends upon an understanding that not all computer frames are alike. Hannafin and Peck (1988) address transitional, instructional, and question frames. Transitional frames are used to tie together the different parts of the a computerized lesson: they provide an orientation to the beginning of, and various sections within, the program; they serve as bridges between various topics or sections; they provide feedback, directions, and instructions; and periodically, they present a progress report to let the learner gauge success. Instructional frames present basic information to the learner: these frames can alert the student to a need for prerequisite information; provide links between relationships from past and current learning; and provide definitions, examples, and rules. Question or criterion frames solicit input from the student to help individualize the instruction.

There are also variations to the general type of frames. For example, sometimes a frame contains both instruction and a question. Copy frames, prompt frames, hint frames, and interlaced frames are some types of variations (Hannafin & Peck, 1988). Copy frames provide information and a question about that information in the same screen. This type of format can be helpful in directing student attention, emphasizing important points, and for assuring a high degree of success for particular students. But because they are so obvious, copy frames are considered very elementary and need to be used sparingly.

Prompt frames direct the learner to supply input; these can be used effectively for questions as well as instructional screens. Hint frames are usually provided after a student has failed to enter an expected response; they offer guidance but do not supply the correct response. Interlaced frames are hybrids which combine various components from the standard frame types; they might include instruction, question, and feedback all on the same screen. This design can appear cluttered if not presented carefully but it has the advantage of allowing the student to visually examine and compare the question and feedback.

Each type of frame depends upon grouping of information in a way that visually aids the reader. To make optimal use of visual cues, it is helpful to design standard protocol for each type of frame and use it consistently throughout the program. Whatever protocol is chosen will need to comply with the overall program design. Programs that vary the screen location of pertinent information or procedures used to advance throughout the program can be confusing and frustrating (Mackey and Slesnick, 1982). Although standard protocol is necessary (Heines, 1984; Lentz, 1985; Simpson, 1984) designers can provide artistic variation to other parts of the screen to suggest meaning.

Meaning Of The Image

Information becomes valuable as it takes on meaning for an individual. Since visuals are meant to aid in the discovery of meaning, it follows that well-designed visuals will help students interpret the meaning. A learner's interpretation of the image can be affected by the text, type of graphic, and layout employed.

Layout must consider the principles of perceptual organization, which include similarity, proximity, continuity, and closure (Bloomer, 1976). These four processes, by which the mind organizes meaning, depend on how physically close the objects are, how similar they are, whether there is a continuous line to guide the eye, and whether the minimal amount of information is present that is necessary to obtain meaning or closure. Comprehension is directly affected by the way the mind organizes meaning from the placement of graphics and text.

Creating Meaningful Data Displays

Since powerful computers and software are now available to many people, the practice of transforming numerical data into visual displays is no longer limited to trained professionals. It follows that some design guidelines are needed.

There is a wide selection of software that produces graphs to tabulate or represent data. These data displays can take the form of circle or pie graphs, bar or chart graphs, line graphs, histograms, and scatterplots, among others. The ease of creation does not always result in good, meaningful graphics. It is important to follow some common sense approaches to graphical data display, whether the information is to be used on or off the screen, locally, or at a distance.

It is tempting to use various software features to make elaborate and colorful graphs, but in reality simple is better when displaying data (Tufte, 1983). To help learners interpret the meaning of graphs, the ***Building Family Foundations*** project uses only those dimensions and colors that are necessary to convey the message; three dimensional graphs should only be used when the third dimension represents a third aspect of the data interpretation, and color should only be used for contrast as an interpretational aid.

Visual information is frequently misrepresented by lay people who produce data graphs without the benefit of proper guidance. This practice can be dangerous since it can confuse and mislead consumers. Computers are not responsible for poor visual design, but they make it possible for uninformed users to produce inadequate products.

Impact Of The Image

Computer graphics and appropriate screen displays have the power to communicate by adding an image to the text. Visual images can aid message interpretation and enhance learning. They can also add specific impact to the message by providing an emotional element that is beyond that of other communication strategies. Realism can be enhanced by providing a graphic component. Images can represent realistic data ranging from simple sketches or graphs to intricate displays or vividly emotional scenes. Virtual reality can even conjure up imaginary situations through artificial imagery.

This project uses imagery in either the videodisc mode or the computer-based mode, depending on what is needed. The videodisc has the potential for using motion or still as well as monotone or color images. The realism of images can add significant to the impact.

SUMMARY

Structure, meaning, and impact combine to produce effective instructional images that can be created on computers. The structure of the image considers both the components of computer images and the elements of good screen design; the interworkings of both produce effective instructional displays.

New levels of knowledge, a variety of media options, and sophisticated software, offer the ability to improve computerized images and their resulting products. Although text remains a very important part of computer communications, today's technology encourages the use of more more graphics.

Understanding and emotional impact can be enhanced through powerful computer imagery. The imagery can represent real situations or it can create an artificial situation that appears to be real. Today, artificial reality remains limited to a small set of applications and is accessible to a restricted range of people, yet its future potential is tremendous in terms of visual communications and educational impact.

The **Building Family Foundations** project tries to incorporate the best features of multimediated instruction. It hopes to avoid mistakes and enhance learning by attending to the practice of good instructional design and appropriate use of good visual imagery. The imagery can very greatly improve the understanding of students who are working independently at a distance without the benefit of an instructor's presence.

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Learning Visual Design Through Hypermedia: Pathways to Visual Literacy

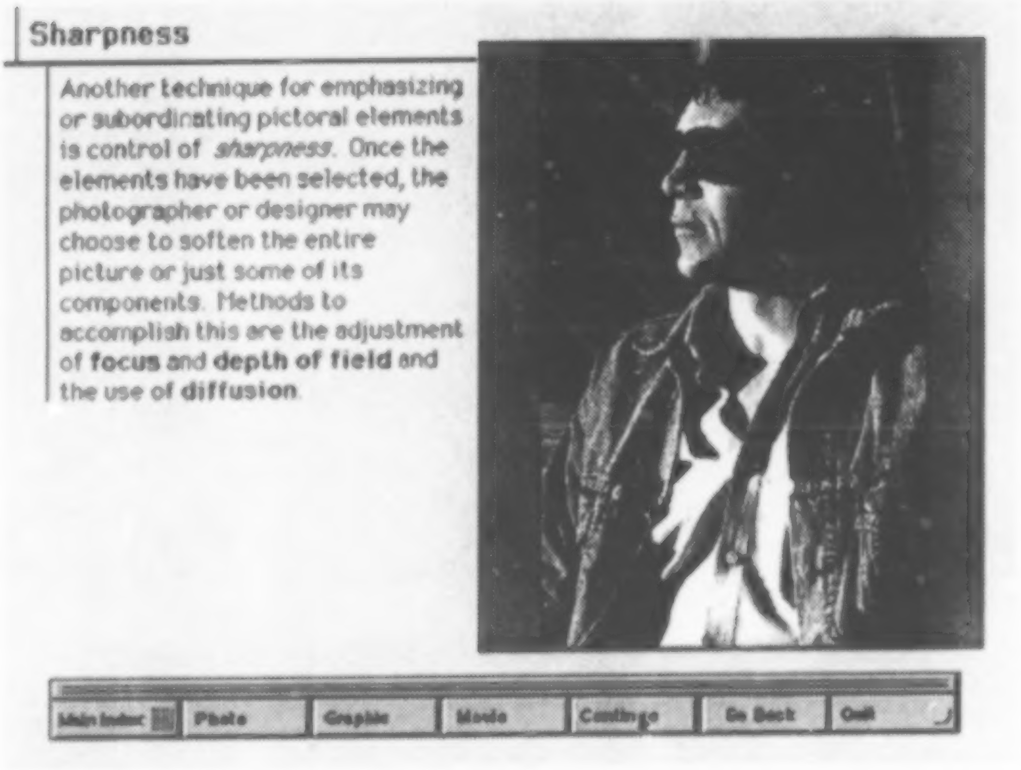
Barbara Lockee
Tom Hergert

Visual literacy is difficult to separate from other communication skills, especially because in the modern world we are all the targets of a large volume of visual stimuli. Much of what we see is intentionally designed to convince, cajole, or sell. Visual creations are intended to instruct or to please, or to do both, following Horace's description of the purpose of poetry and the theater (Rhys, 1911). The challenge for visual literacy educators is to help enable others to understand the overt messages in visual constructions, *and* to analyze the less obvious messages that are carried by the images.

The interactive multimedia application described herein attempts to provide learners and teachers with a common frame of reference for communicating about visual media. Developed in *Macromind® Director™*, this system is based on a list of concepts related to composition, and illustrates those concepts with photographs, paintings, graphic designs, and motion picture scenes.

This system evolved from an earlier *HyperCard®* demonstration which used black and white photographs and graphics, many of which were copyrighted. Feedback from the use of the system in a series of courses convinced the authors to expand the program through the use of *Director™* and its capabilities for color visuals and increased interactivity. The present version employs only images for which copyright is held within our university community, thus eliminating copyright questions.

After brief introductory screens users are presented with a list of concepts and a text field that explains the system and basic navigation methods. A button bar at the bottom of each screen allows choices of examples for each concept or other navigation through the interactions. Screens are laid out consistently to aid learners in connecting the various sections of the application. Each screen has a graphics field and a text field in which related concepts may appear as part of the explanation of the screen's topic. Clicking the mouse on words or phrases in **bold** type will play the screen(s) that correspond to the bold text, giving the user access to the examples attendant to each concept (Figure 1). Future versions of the system will include concepts and terminology from other disciplines, drawing analogies among the various vocabularies.



Sharpness

Another technique for emphasizing or subordinating pictoral elements is control of *sharpness*. Once the elements have been selected, the photographer or designer may choose to soften the entire picture or just some of its components. Methods to accomplish this are the adjustment of **focus** and **depth of field** and the use of **diffusion**.

Figure 1

Visual literacy is a necessity for learners of all ages. As residents of the information society which is characterized by digitized representations of knowledge and dominated by the mass-media, we must learn to analyze and understand what we see. Unfortunately, the American educational system has not adequately addressed this need.

Despite its 14 year history as a more or less formal movement in education, 'visual literacy' has yet to rate more than a passing glance from a majority of educators. As a result, it has remained on the periphery of education gently bobbing up and down in the swells of broader and seemingly more significant educational waves. As a discipline, it suffers from the lack of a commonly accepted definition and mainstream sponsorship. It is beset both from within and without by doubts as to the appropriateness of use of such terms as 'literacy' and 'language'. In fact, the term 'visual literacy' has become a catchall label attached to any project with a visual component however uncertain its methodology or outcomes. At an ever more fundamental level, some critics question whether 'seeing' can be taught while others suggest that, even if it can, there is really little necessity to do so. And yet, despite its rather ambivalent ride, visual literacy, unlike other educational waves, has not yet crashed upon the beach (Eshpeter and DeLeeuw, 1983).

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Most instructors no longer question whether they should teach the content, but rather how to teach it. Of central concern is developing a functional vocabulary common to teachers and learners. It is the present authors' belief that a solid beginning can be made using terms usually employed to describe concepts in photographic and motion picture composition and construction.

Our culture constantly presents (assaults?) us with visual images that have been carefully designed, although their accidental juxtaposition may not have been. The evolution of presentation technologies and our own increased access to those technologies ensure that the sheer volume of interactions with artificial visual stimuli in our lives will continue to increase. The challenge for educators is to be able to differentiate types and structures of visual stimuli and to read the overt *and* covert messages that visuals carry.

Still photographs, singularly or as components of other media, are perhaps the most prevalent form of modern visual communication. "We no longer live in a logocracy–a culture based on verbal texts–but in a culture characterized by omnipresent visual images in forms such as television, film, billboards, architecture, and dress" (Foss and Kanengieter, 1992). We absorb visual images from photographs every day through newspapers, magazines, advertisements, and billboards. Moving pictures come as television, cinema, videos, and computer images. Not only do we 'read' these types of information constantly, but many of us possess the means to create our own images. Photography and video are common hobbies in much of the world. We use a potpourri of camera makes, models, and formats to preserve memories of quotidian existence and of special events such as vacations, weddings, graduations and other ceremonial occasions. Photographs from personal snapshots to Ansel Adams's, Margaret Bourke-White's, or Diane Arbus's masterpieces illustrate a broad range of experiences and skills. A photo is a very familiar visual frame, a still image from which we draw meaning.

Access to improving technologies makes it increasingly likely that people will be creating and *manipulating* their own images "for fun and profit." Analysis such as outlined here will help to empower potential image-makers by increasing their insight into the attributes of the tools available.

The histories of at least three or four (sub)cultures come into play in any analysis of visual messages in an educational context. The things and people represented, the creators of the imagery, the teacher/guide, and the learners are all potentially from different (sub)cultures. As Timberg and Himmelstein (1989) demonstrated there are often many cultures and subcultures represented within a group of learners . The perspectives and contexts of each group must be explored in order to gain understanding of visuals experienced in the learning environment. Some sense of their respective cultural histories will allow teacher and learners to connect and clash constructively with the examined work.

Each visual media instructor has a favorite arsenal of images with which to teach the concepts that our project presents. The process usually involves slide shows, video and film viewings, reading and looking assignments, or some combination of these and other activities. This project presents a temporally economical approach to developing a common image base that can be referenced throughout a course or workshop.

In order to understand visuals, their construction, and their power, an individual must be able to recognize where on the continuum from archival recording to non-referential abstraction a particular visual experience lies. And lie it might. Even the most seemingly realistic motion picture sequence or the most effective news photo lives in the context created by the image maker and in the circumstances of its presentation.

The ability to "read" the meaning of a picture is valuable, especially in that many visuals are created to persuade us. Visual persuasion often can be much more subtle than its verbal counterparts. Familiarity with pictorial composition and the vocabularies used to communicate about it will allow us to be more active and aware as consumers of information, preventing us from becoming victims of manipulators of visual imagery. McIsaac presents a strong example of the dangers.

> *As long as male producers, male photographers and male directors continue to use photographic elements such as camera angle, body position, and lighting to perpetuate the stereotype of women as unintelligent and passive sex-objects, women will not be taken seriously in the work force...However, in an industry such as mass media which has been historically patriarchal, new awareness must be gained. It is in the subtle manipulations of the media that the message is created, and it is to this area of visual language that we must now turn our attention.* (McIsaac, 1984).

Critical viewing skills are not just a personal necessity; they are a societal responsibility. By developing visual awareness, we become more cognizant of social issues which deserve our attention, such as class, gender, and racial stereotyping.

An effective image grabs the viewer and says "this is what I am," and each viewer processes the information in the image through the filter of her/his frame of reference and will "know" what the image is saying. Accepting this first take as the truth of an image is often as far as many viewers ever go, and, especially in the case of entertainment, conscious analysis is believed to ruin the experience.

Some critics of the visual literacy movement have proclaimed that analysis of images is a simplistic activity because realistic pictures reveal their intent and meaning almost immediately. On the contrary, analysis and interpretation should be a complex and thoughtful process precisely because visual imagery appears to be so straightforward..

> *Photography expands by ratio difficilis (Eco, 1976) the continuum of material ready for semiosis. It quotes, and it quotes profusely, and through the mere act of quoting transforms the glance into a gaze. The very act of quoting a detail suggests its significance... "Theoretically, a perfect photograph is absolutely inexhaustible." (Holmes, 1859, p. 247) By its practice the camera suggested at a theoretical level that the very act of seeing was semiotic.* (Biocca, 1986).

Learner participation will quickly clue a teacher to the frames of reference of a group of students so that analysis can be made concrete by relating to students' prior knowledge. Correlating their prior knowledge to traditional aesthetic perspectives and to visuals being discussed will help students to expand their own visual horizons and more easily understand new stimuli as they are encountered.

The internal logic of visuals is often foreign to some viewers. Discovering such logic can lead a learning group to insights about the visuals and about their own perspectives. How all the elements within visual constructions interact serves to portray a more or less complete image of a world. Dissonance among the learners and between the learners' experiences and the visual presentations can highlight points of interest that may lead to better discussions and further understanding.

> *If you look at a fern and merely say, "Yes, that's a fern", you may not be seeing past the old, familiar label of its name. But if you really 'see' a fern, you will notice triangularity, individual leaf fibres, various shades of green, its sway and dance before the wind. If you put your eyes close to the fern, so close that you cannot focus on the plant at all, but only on objects beyond it, the fern will become a nebulous green haze which drifts across the background scene. You will have found dimensions and hidden beauty not included in the usual definition of the fern, while learning for yourself the difference between looking and seeing* (Patterson, 1979, as cited in Eshpeter et al, 1983).

A teacher can investigate an image or sequence, aiding learners in deconstructing what they see. Dividing visuals into their technical elements illuminates the kinds of control exercised by clients, creators, and technicians. Students can then build organizational plans for their own imagery, referring to this knowledge base.

When students learn to communicate verbally about how creators convey ideas, moods, and atmosphere through composition, they are describing concepts with broad applications. The learner can apply these guidelines to any visual presentation. Command of a vocabulary which aids in understanding of composition therefore produces a more visually literate student.

Composition as the control of the elements within a visual construction has been defined as "the act of combining parts and elements to form a *whole* (emphasis ours)" (Goldsmith, 1992). From this definition it is clear that the importance of compositional control is common across media. Many of the guidelines to good composition were codified by classical artists during the Renaissance and remain as standards in fine, popular, and practical arts.

Photography and motion pictures have moved away from rigid rule-keeping, but many of the standards of good composition are still applied. Designers in other visual media also commonly implement these principles. Using design concepts common to many visual media and illustrating them with examples that are common in our society (as featured in the multimedia application described elsewhere in this paper) provides a relevant framework for teaching visual literacy.

> *Although only a few gifted individuals are born with the potential to become great artists or photographers, virtually everyone has some sense of design or composition. Unfortunately, it's often neglected or suppressed by an educational system that places too little value on visual literacy. However, as most teachers of art and photography agree, it's a skill that can be revitalized at any age if you try (Goldsmith, 1992).*

As illustrated through this project, attention to composition provides visual literacy educators with a starting point for guiding learners of all ages toward the necessary skills for "reading and writing" visual images. "Looking at pictures--photographs, paintings, other forms of visual art--can imprint a sense of effective composition, a feeling for visual structure, onto your mind's eye and into your subconscious" (Goldsmith, 1992). Through the analysis of compositional elements, students across the curriculum can evaluate the choices made by professional visual designers as realized in their creations. Students capable of integrating these analytical skills into their own work will be more effective visual communicators.

Having minced the visual experience into thousands of tiny components, chopping away from every available angle, there is a danger that fun, basic understanding, and personal engagement with the whole will all be lost. To combat the possibility that learners will become jaded cynical nit pickers, the examination of a visual work must make at least one loop in the spiral of understanding.

It would be a disservice to learners to disassemble visual presentations to the point where fun is banished from the experience. To help learners get the most from visuals, it is important to aid them in learning to reconstruct messages and reintegrate elements into a coherent whole which, while better understood, should be no less enjoyable.

The elements of a visual image, series of images, or motion sequence can be deftly separated using the resources discussed herein. Insights into ourselves, our cultures, and our representations of reality can help prepare us to better understand our mediated experiences. If we are to truly understand an interaction with visual media, we must be able to *experience* it, illuminated and enhanced by our explorations. To exercise their developing skills, learners should be encouraged to revisit familiar visuals thus, enlarging their perspectives on what they see and perceive. Ideally, the tools built through this process will enable students and teachers to filter more effectively and make wiser choices about allocating their attentions. Having chosen what to attend to, we will be able to enjoy experiences that we deem valuable, appreciating the craft and thought of the creators and better integrating the messages into our lives. When we accidentally find ourselves witness to a visual event, such broadened perspectives will allow us to learn from what we see, in terms of what it means and how it was created.

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Emoticons: Visual Cues for Computer-Mediated Communication

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Introduction

Emoticons are visual cues formed from ordinary typographical symbols that when read sideways represent feelings or emotions. For example, the combination of symbols :-) represents a typical smiley face and conveys the sentiment that the person sending the message and using that particular emoticon is pleased, happy, agreeable or in a similar state of mind.

Emoticons have received attention in the popular press in association with computer-mediated communication (*400 Readers*, 1994; McNichol, 1994; Sanderson, 1992). Though computer-mediated communication (CMC) can be much more involved than the mere sending and receiving of messages, CMC is commonly referred to as electronic mail or *e-mail*. Because the use of e-mail eliminates visual cues such as head nodding, facial expressions, posture, and eye contact found in face-to-face communication, CMC users often incorporate emoticons as visual cues to augment the meaning of textual electronic messages.

The goals of this paper are to: 1) discuss the utility of emoticons as visual cues from the perspective of traditional communication models, and 2) present and discuss research regarding the frequency and variety of emoticons in selected computer-mediated communication.

Background and Rationale

Determining the meaning of any given communication can be an elusive endeavor. Effective communication is not simply a matter of analyzing individual word denotations and connotations, it is a blend of many factors. Words, grammar and structure, context and experience, nonverbal signals, and other cues all contribute to meaning in a message. During interpersonal interactions, face-to-face nonverbal cues constitute a significant part of a communication's meaning and believability. For example, visual cues such as body language, facial expression, eye contact, and posture provide important cues to the subtle and often not-so-subtle meaning of verbal messages. People read visual cues to ascertain if their perceptions of verbal messages are correct. In training and instruction, a time-honored rationale for the use of visuals to support communication is that visuals can clarify, augment, and reiterate verbal messages. The old adage, "a picture is worth a thousand words" suggests this capability of visuals to communicate volumes in just one image.

Emoticons can provide support to written communication, in much the same way that visuals or body language can enhance verbal communication. Facial expressions are especially important in conveying emotions and nuances of meaning during face-to-face interactions, and emoticons are a means for better defining emotions and intent regarding a particular phrase or statement sent via electronic mail. Though the medium of electronic mail relies heavily upon text-based verbal messages to accomplish the task of interpersonal communication, by integrating emoticons into communication an alternative for facial cues found in face-to-face contexts is provided. For example, the joke, wry remark, or bit of wit sent over e-mail can be followed by the visual cue ;-) to emphasize the jesting nature of the comment. A sad statement can be emphasized by a sad icon :-(or an exclamation can be stressed by a surprised emoticon **<:-o** .

Although the use of emoticons theoretically can assist in clarifying the exact meaning of an electronic message, little seems to be known about the frequency of their use, the interpretations and recognition of the various symbols, and the appropriateness and integration of these visual cues in electronic communication. The authors embarked on this study primarily to explore the use of emoticons in CMC. Specifically, this study is a preliminary investigation designed to provide seminal information regarding the following questions:

1) With what frequency do emoticons appear in selected examples of electronic communication?

2) What variety of emoticons appear in these same CMC data sources?

3) What usage patterns begin to emerge regarding the use of emoticons as visual cues?

4) What factors may influence the use of emoticons used in electronic communication?

Data Collection and Analysis Procedures

Four listservs were selected as sources of data for this study. The first, *Globaled '93*, was a closed listserv established for an interinstitutional collaborative university course project described in more detail below. The AECT-L (Association for Educational Communications and Technology Listserv) is a service of the professional organization, The Association for Educational Communications and Technology, with which the authors and other members of the International Visual Literacy Association are affiliated. The SEMOIS-L (Semiotics) listserv was chosen from the listservs published in *The Internet Directory* (Braun, 1994). This listserv was selected because 1) the study of emoticons can be considered a semiotic investigation, 2) the archives are available and accessible to the public, and 3) the study of semiotics relates to visual literacy and reflects the professional interests of the authors. The final listserv, TRDEV-L (Training and Development discussions) was chosen from many listed in the *Directory of Scholarly Electronic Conferences* (Kovacs, 1994). The TRDEV-L discussion list focuses on the field of training and development is therefore tangentially related to the application of learning theory and the use of visuals in instructional contexts.

Archival transcripts of each listserv, downloaded from electronic Internet sources, were analyzed for the use of emoticons. The decisions affecting the choice of months during which the CMC interactions on each listserv were monitored and additional listserv-specific information are discussed in the sections dealing with each of the individual listservs. Total messages, messages containing emoticons, the type of emoticon used, and the person who generated the emoticon were tallied by the authors during the data collection procedures. Results emerging from each listserv are discussed below.

Results from Selected Listservs

Globaled '93

General Description of the List

Globaled '93, an inter-university collaborative learning experience, linked graduate students in several universities via a computer-mediated listserv. The goals of the electronic discussion forum were to provide students opportunities to 1) discuss issues related to the field of distance education and 2) experience distance learning by using computer-mediated communication. Though participation in the electronic forum was a class requirement at the institutions involved, the *Globaled '93* conference provided an opportunity for students working together across barriers of time and distance to exercise control, autonomy, and responsibility for the direction, content, and success of the CMC experience. Further elaboration on the *Globaled '93* project is found in Gunawardena, et al. (1994) and Rezabek, et al. (1994).

During the month of September, *Globaled '93* participants posted initial introductions of themselves as part of the preclass activities. These introductions were not analyzed in the current study since they were not considered a part of the structured *Globaled '93* interactions and were not archived. All interactions during the months of October, November, and December, the three months in which *Globaled '93* participants communicated via CMC after posting the initial introductions, were analyzed for the participants' use of emoticons.

The use of emoticons occurring naturally was observed by the authors who participated as faculty in the *Globaled '93* project. On November 28, the authors sent a message to all *Globaled '93* participants that presented the concept and examples of emoticon use and supplied a brief dictionary of emoticons. No other interventions were made to the natural progress of the CMC interaction.

Frequency of Messages and Emoticons

During the month of October, 349 messages were posted on the *Globaled '93* listserv, and 8 of these (2.29%) contained at least one emoticon (see Figure 1). Of the eight messages containing emoticons, only one message contained two emoticons and no message contained more than two of these visual cues.

In November, 396 messages were posted on *Globaled '93* with 25 messages (6.31%) containing emoticons (see Figure 1). Of the 25 messages in which emoticons were used, again only one message incorpo-

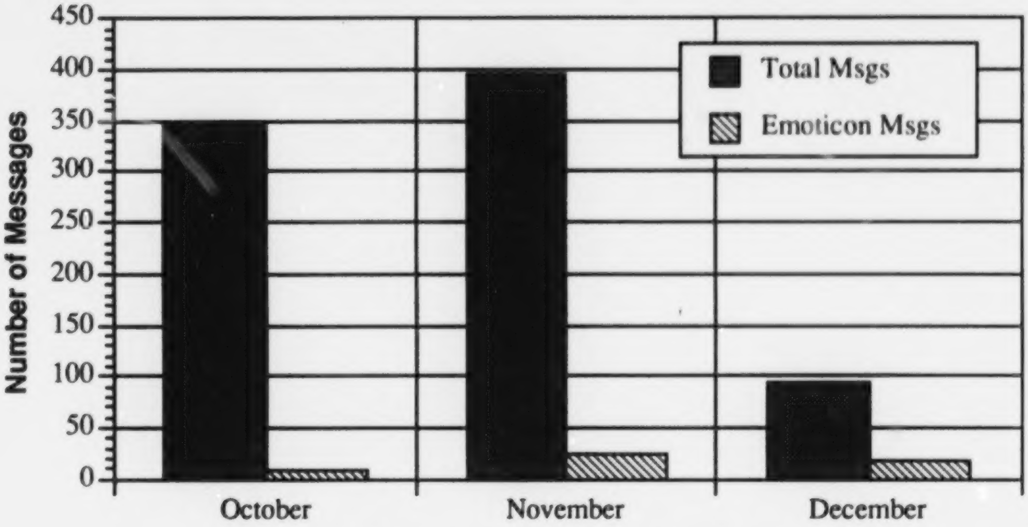

Figure 1: *Globaled '93* message traffic and emoticon frequency by month.

rated two emoticons, and no message included more than two emoticons.

From December 1 through 17 when *Globaled '93* officially ended, 94 messages were sent with 18 messages (19.15%) containing emoticons (see Figure 1). During December, five messages were sent that contained two emoticons but no message contained more than two.

Overall, during the months of October, November, and December, 839 messages were posted with 51 (6.08%) of these messages containing emoticons (see Figure 2). Seven of these 51 messages contained 2 emoticons but no message contained more than two.

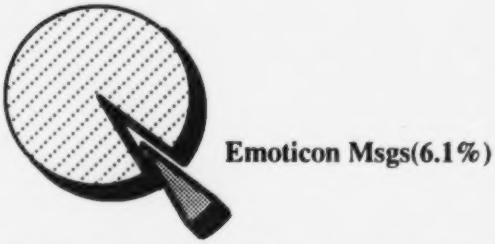

Figure 2: Percentage of *Globaled '93* messages that contained an emoticon

These frequency patterns indicate a percentage increase in the use of emoticons over time, with a specific frequency pattern increase observable after the on-line introduction of emoticons on November 28. Additional frequency patterns emerge from the emoticon data. Figures 3, 4, and 5 display the dates on which messages and messages that contained emoticons were posted during the months of October, November, and December respectively.

During the month of October, the middle of the week was students' favorite time to post messages. The highest average amount of traffic occurred on Wednesdays with over 19 (19.5) messages per day being sent. Wednesday was also the day on which most emoticons were sent, with an average of one emoticon used in a message every Wednesday. The greatest number of messages (30) sent on any one day in October

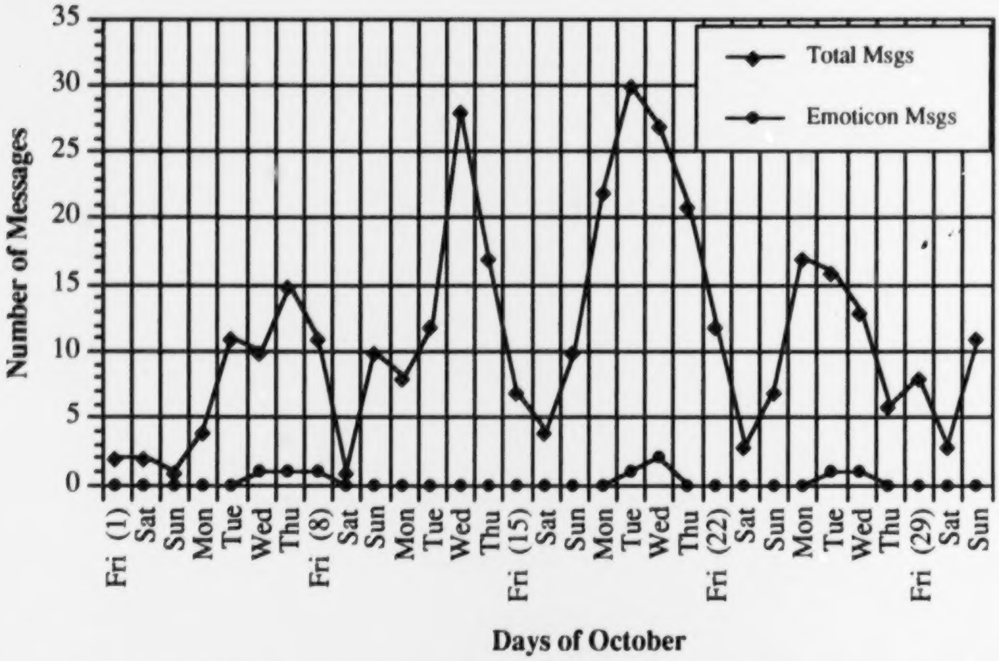

Figure 3: Daily traffic including emoticon messages for October on *Globaled "93*

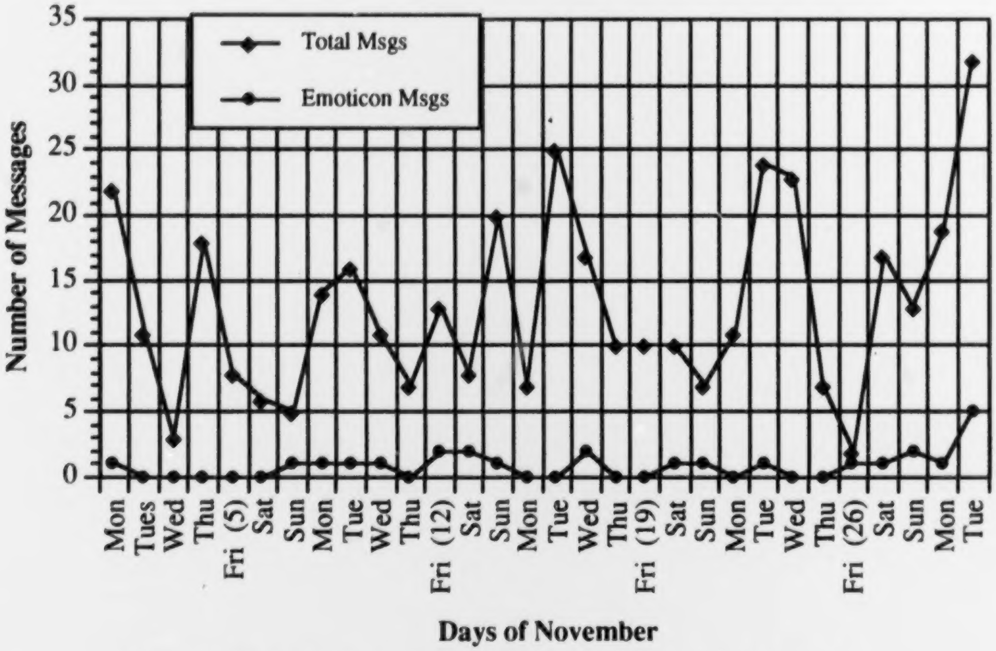

Figure 4: Daily traffic including emoticon messages for November

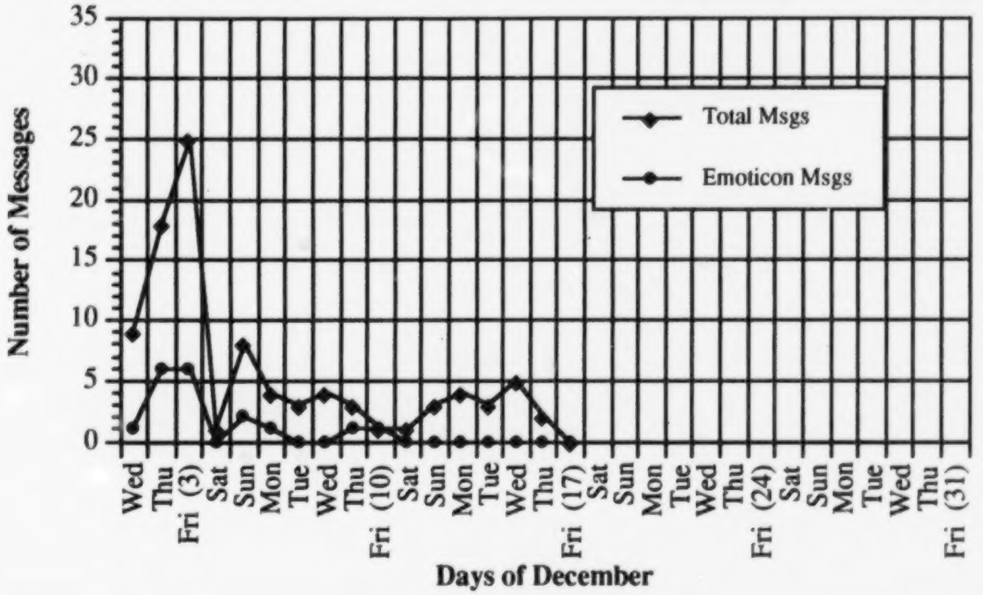

Figure 5: Daily traffic including emoticon messages for December

occurred on Tuesday, October 19th. The greatest number of emoticon messages (2) sent on any one day in October occurred on Wednesday, October 20th. Saturday was the students' least favorite time to post *Globaled '93* messages with fewer than 3 messages sent each Saturday. No emoticons were sent during the weekends in October.

The middle of the week remained students' favorite time to post messages in November. Tuesday had the highest average amount of traffic with almost 22 (21.6) messages sent each Tuesday. Tuesday was also the most frequent day for emoticons to appear in November, with an average of over one (1.4) emoticon message being sent every Tuesday. The greatest number (32) of messages sent on any one day in November occurred on Tuesday, November 30th. The greatest number of emoticon messages (5) sent on any one day in November occurred on that same Tuesday. In November, Friday was students' least favorite time to send e-mail messages, with an average of 8.25 messages sent each Friday. Weekend use of e-mail increased dramatically in November, and emoticons occurred every day of the week except Thursdays. No emoticon messages were sent on a Thursday during November. During the Thursday/Friday period of the Thanksgiving holiday, only 9 messages sent and only one of those contained an emoticon.

December 17 was the date on which the *Globaled '93* discussion list was closed down, and traffic began to taper off as the semester came to an end. The most popular day for students to post messages was on Fridays with an average of 8.67 messages sent. The greatest number (25) of messages sent during one day occurred on Friday, December 3. December messages averaged over 1 emoticon message per day (1.06) with 6 emoticon messages sent on both Thursday, December 2 and Friday, December 3. Messages occurred fairly evenly over the days of the week, but Saturday again emerged as the least active day with an average of only one message sent each Saturday and no emoticon messages occurring.

Variety

In addition to frequency patterns, the type and variety of emoticons were analyzed (see Figure 6). The most frequently occurring emoticon was a traditional smiley face, :-) , that occurred 23 of the 58 times (39.66%) when emoticons appeared in the interactions. The second most frequently occurring emoticon, a smiley face without a nose, :) , occurred eight times and represented 13.80% of the emoticon use. The wry or winking emoticon, ;-) ,occurred four times, representing 6.90% of the emoticons used. The emoticons associated with a sad or unhappy message, :(, and a laughing or exuberant message, **:-D** , each appeared three times or 5.17% each of the times emoticons appeared. All other emoticons appeared only once or twice in CMC messages and are displayed in Figure 8.

Users

Data indicate that 20 of the 92 (21.74%) *Globaled '93* participants included emoticons in their messages. Figure 7 displays the use of emoticons by university site and shows the number of messages containing emoticons that were generated at each location and the number of people at that location who were responsible for the group totals (each person is represented by a different letter).

Five people at The University of Wisconsin—Madison sent 17 of the 51 messages (33.33%) containing one or two emoticons. The following represents addi-

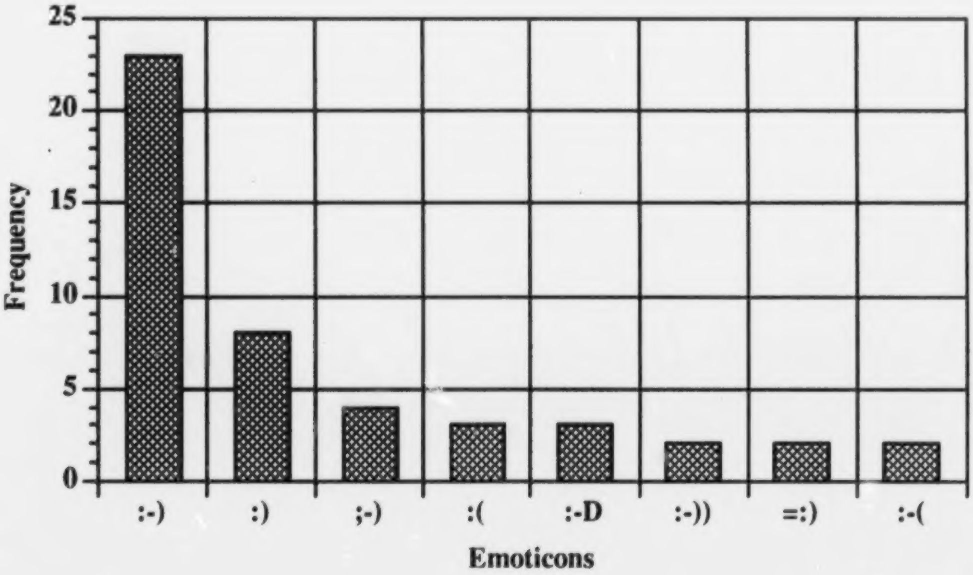

Figure 6: Most frequent emoticons in *Globaled '93*

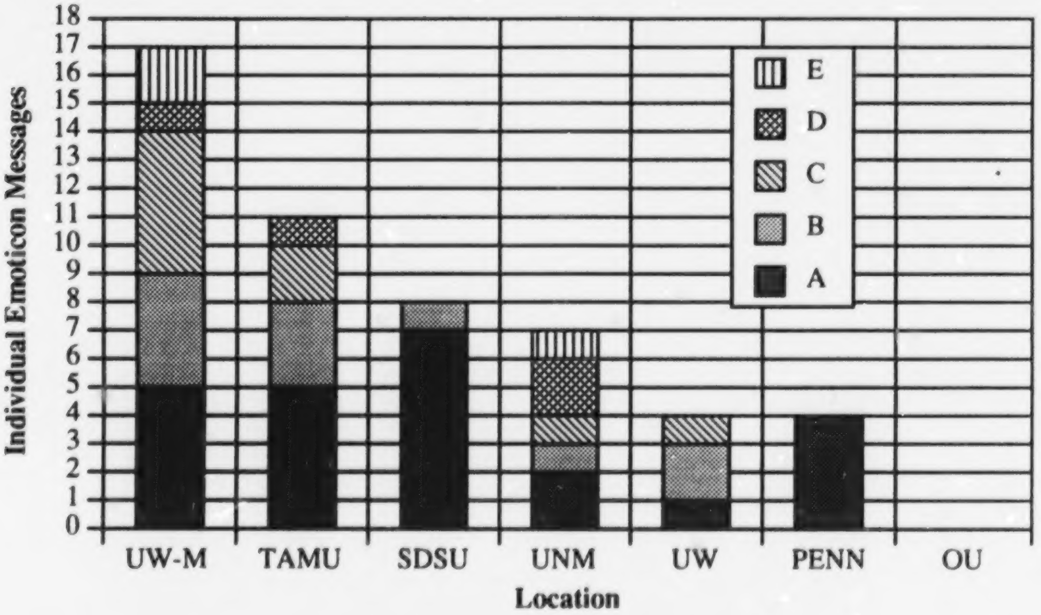

Figure 7: Emoticon users by location in *Globaled '93*

tional institutions, individuals, and emoticons sent: four people enrolled at Texas A & M University (11 messages, 21.57%), two people from San Diego State University (8 messages, 15.69%), five people at the University of New Mexico 7 messages, 13.72%), three people from the University of Wyoming (4 messages, 7.84%) and one person at the Pennsylvania State University (4 messages, 7.84%).

Results from the *Globaled '93* list were the most complete set of data analyzed. As indicated above, however, participation was a required class-related activity. Three voluntary academic discussion lists also were selected and data analysis was conducted for purposes of comparison and contrast. Finally, a brief survey of emoticon use in newsgroups was made, but Spinuzzi's (1992) study has already examined emoticon activity in newsgroups.

AECT-L

General Description of the List

The listserv of the Association for Educational Communications and Technology is a free subscription open list available to those interested in discussing issues dealing with media, technology, educational communications, and associated issues. The listserv began in the spring of 1994 and is moderated from the University of West Virginia. Data for the months of April, May, and June were selected due to their availability and apparent "average" level of interaction.

Frequency, Variety, and Users

Messages from the AECT-L were analyzed for the frequency and variety of emoticons. During April, May, and June, a total of 156 messages were sent with only 2

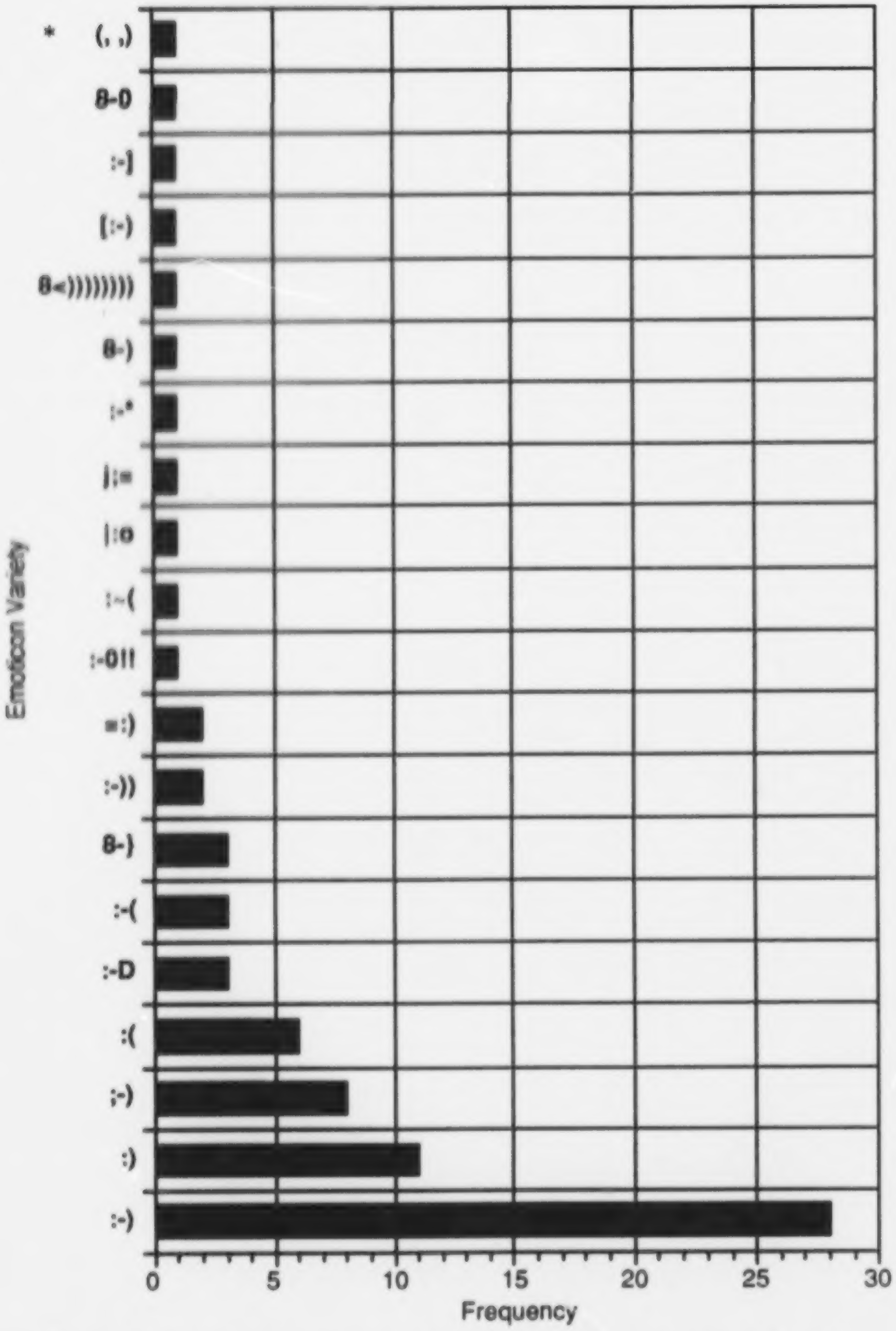

Figure 8: Variety and frequency of emoticons encounter during this study.
* The topmost emoticon was vertical rather than horizontal and should look like this: (, ,)
-
^

of these messages containing emoticons (1.28%). The monthly totals, for this data were: April—56 messages, 1 emoticon (1.78%); May—42 messages, 1 emoticon (2.38%); and June—58 messages, 0 emoticons (0%).

Two different individuals used emoticons in the AECT-L interactions. The listserv participant who used an emoticon in April sent a smiley face, :) , and the participant who sent an emoticon in May used the smiley with a nose, :-) . These two were the only emoticons used during this time period, and informal monitoring has shown similar limited use of emoticons in ensuing months.

SEMOIS-L

General Description of the List

The discussion list SEMIOS-L (Visual and Verbal Semiotics) was formerly known as TELESI-L. The discussion focuses on issues related to semiotics, verbal and nonverbal communication, language behavior, visual issues, and linguistics. The list is moderated and archived monthly at the listserv in Louisville, Kentucky. Data from May, June, and July were selected due to availability and close approximation to the time period examined from the AECT-L.

Frequency, Variety, and Users

During the months of May, June, and July, 134 messages were sent on SEMIOS-L. Only one of these messages (.75%) was an emoticon message. This message contained two visual cues, a happy face, :) , and a sad face, :(. The extremely limited use of emoticons in SEMOIS-L was verified by spot checks during other months.

TRDEV-L

General Description of the List

The Training and Development Discussions (TRDEV-L) electronic list focuses on issues regarding the training and development of human resources. The list is moderated and archived monthly at a Pennsylvania State University listserv. The list is intended to stimulate collaboration and assistance in research, training, and development for academic and professional communities.

Frequency, Variety, and Users

Messages appearing on TRDEV-L were analyzed for frequency and variety of emoticons during the months of April, May, June, and July, 1994. During April, 100 messages were sent, non of which contained emoticons. May messages totaled 134. One message (.75%) contained two emoticons, a sad face, :(, and a happy face, :) . In June, 111 messages were sent, seven (6.30%) of which contained at least one emoticon. These seven emoticons were generated by four people. One of these messages contained three emoticons, the greatest number found in any message analyzed: two **8-}** and one ;-) .

On June 30, one of the TRDEV-L members spontaneously posted an emoticon dictionary. To ascertain any immediate effects of the dictionary on the variety and frequency of emoticon use, messages from the month of July were analyzed. During July, a total of 144 messages were sent, 7 of which (4.86%) contained one emoticon each. These messages were sent by five different individuals and were common emoticons evidenced in earlier messages.

USENET

General Description

As a comparison to the academic discussion lists examined earlier, a brief review of e-mail messages appearing in the USENET was conducted. USENET is a set of newsgroups which predates the Internet. The news groups are organized hierarchically into broad, major categories which are divided into subgroups. The seven major news categories are computer science and related topics (comp.), the news network and software (news.), recreational activities and hobbies (rec.), scientific research and applications (sci.), social issues (soc.), debate on controversial issues (talk.), and everything else (misc.) (Krol, 1992).

Frequency, Variety, and Users

For this study, messages in the major categories of recreational activities and social issues were reviewed These categories were chosen because the authors suspected that the nature of the communications would be less formal than those found in the academic listservs or some of the other USENET categories. In the recreation category (rec.), topic areas include backcountry, pets, guns, arts, antiques, autos, games, humor, and similar groups. The social (soc.) topics include religion, culture, history, college, and others.

The examination of data included 60 randomly selected messages sent during the month of September. Of those 60 messages, 15 messages included emoticons (25%). These 15 messages included 11 different emoticons; only the two traditional smiley faces, :-) and :) , and the winking face, ;-) , were repeated. Emoticons from all data sources are included in Figure 8.

Although the reasons are unclear, it does appear that messages appearing in USENET contained a greater frequency and variety of emoticons than messages found in either the required or voluntary listservs discussed above. Spinuzzi (1992) found that the range of emoticon use on the USENET newsgroups varied from 0 to 25 percent and averaged about 11 per cent of the total postings. Data collected in the present study supports Spinuzzi's findings.

Issues and Observations for Further Investigation

Emoticons are important to understand as possible sources of visual cues for use in electronic environments, but this research only begins to investigate the queries posed as initial questions underlying the current study. Preliminary patterns emerging from the data collected, possible assumptions and attributions, and emerging issues for further research are related to four major questions listed below.

1) *With what frequency do emoticons appear in selected examples of electronic communication?*

- The use of emoticons presently does not appear to be a high-use element of e-mail communications in the data sources chosen. Emoticon use in this study ranged from 0% to 25% depending upon the time period and the source of message traffic.

- In the *Globaled '93* listserv, the higher the volume of traffic, the more likely emoticons would appear. However, this tendency did not hold for other data sources.

- Introduction of the emoticon dictionary in *Globaled '93* precipitated both verbal comments and the more frequent and varied use of emoticons. Apparently, the distribution of the emoticon dictionary did not appreciably affect the frequency or variety of emoticon use in the TRDEV-L forum. This observation may be accounted for by individual user characteristics, the nature of the discussion group, and novelty effects.

2) *What variety of emoticons appear in these same CMC data sources?*

- A symbol that has little or no meaning within a given community is not likely to be highly used. Though a variety of emoticons may reflect individual creativity, high frequency emoticons are most likely the ones that are best understood, hence variety may be limited. Many of the more "creative" emoticons have multiple meanings and are difficult to interpret, and some users provided verbal explanations of their visual cues. The range of variety seen in this study is shown in Figure 8.

- Individual preference and creativity appear to influence the development of new emoticons, the use of emoticons, and the context within which emoticons are interpreted. Spinuzzi (1992) has suggested that users both understand and use a limited number of emoticons and that emoticon interpretation is highly contextual.

3) *What usage patterns begin to emerge regarding the use of emoticons as visual cues?*

- The use of emoticons is most likely an individual characteristic perhaps influenced by peer modeling.

- The use of emoticons may be a persistent characteristic of given individuals.

4) *What factors may influence the use of emoticons used in electronic communication?*

- Multiple factors may be at work in the use of emoticons as a nonverbal and visual communication form. Some of these factors appear to be 1) level of communication formality, 2) cohesion of the communicating group, 3) age 4) gender, 5) difficulty of icon reproduction, 6) commonality of meaning, and 7) personal preference and experience. Each of these factors deserves additional study.

Summary

Emoticons are being integrated into electronic communication as a means of supplying visual cues in textual messages. Preliminary observations indicate that the use of emoticons appears to be a highly personal decision and is not yet wide spread among CMC users. Though much remains unknown about the use of emoticons, numerous opportunities exist for investigating the use of these visual cues in electronic communication.

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Digitizing Images for Curriculum 21: Phase II

Alice D. Walker

Introduction

Some five years ago, at the 1989 Conference on Imperatives in Undergraduate Engineering Education, representatives from academe, industry, and government came together to consider the need for change in engineering education. An outgrowth of this conference was the establishment of two coalitions, sponsored by the National Science Foundation (NSF). In 1992, two more groups of schools were added, and in 1994, four additional coalitions were created. Today, 65 institutions of higher learning are involved in a multi-year, multimillion dollar effort to prepare engineering students to meet the demands of industry, emphasizing teamwork, creative problem solving, early design experience, and visually enhanced teaching materials.

Recently we reported (Walker, 1994) on Phase I of a project underway at Virginia Tech, funded by NSF under a grant to the Southeastern University and College Coalition for Engineering Education (SUCCEED), to produce an engineering visual database. Although visual databases exist for the study of art, architecture, geography, health care, and other areas, readily accessible sources of quality images are not available for engineering faculty interested in developing multimedia modules or for students working on individual or group projects.

Presented here is a brief review of Phase I of the Engineering Visual Database project, followed by a description of Phase II with indications of the progress made in the past year.

Engineering Visual Database -- Phase I

As part of a five-year plan to implement new approaches to the teaching of engineering, Virginia Tech is working with other universities in NSF-sponsored consortia to explore ways of improving the effectiveness and efficiency of teaching and learning. New developments in educational technology offer many opportunities to integrate visual material into the curriculum, thus providing a safe environment for close-hand observation, experimentation, exploration, and problem solving. Surveys indicate that while some innovators are creating attractive interactive software, many engineering faculty still rely almost entirely on the blackboard to illustrate classroom lectures. One explanation for the lack of extensive use of visuals is the difficulty in obtaining materials that are pertinent and easily adapted to individual needs.

We proposed, therefore, to create an engineering visual database, composed of existing slides, photographs, video clips, and computer simulations, which could be collected, indexed, and made available to all faculty within the eight-institution coalition. By sharing the resources of faculty from eight schools we hoped to develop a large database covering a broad area of engineering topics.

During the first year of the project, surveys were conducted, and visuals were solicited, collected, sorted, digitized, and entered into HyperCard and ToolBook indexes. Over 700 still images and 28 minutes of motion clips were placed on a videodisc. A barcode index was printed, and materials were distributed to each of the eight schools for evaluation purposes.

Engineering Visual Database--Phase II

The proposal for Phase II of the Engineering Visual Database project included three deliverables:

- the evaluation and revision of the prototype videodisc produced in Year One,
- the creation of new video demonstrations, animations, graphics, and other images, produced on a CD-ROM and a revised videodisc, and
- use of an Internet-based electronic delivery system to provide efficient access among SUCCEED campuses and community colleges.

Usually, research proposals are prepared months before implementation. In an area such as educational technology, where change is occurring daily, this can be particularly disadvantageous.

1. **Videodisc**. Evaluations received from Phase I indicated that although faculty were enthusiastic about receiving the videodisc, they did not put it to use. Many professors cited the unavailability of equipment as a major drawback. One faculty member responded, "I don't have a clue where there is a laser disk player to look at the laser disk, so I was not able to look at any of the movies."

An administrator replied, "Unfortunately we do not have VD players in the college. They have them in our LRC but it is a fight to get people to leave their desk."

In only one instance did we have a report from a totally satisfied user; a graduate teaching assistant (GTA) used the videodisc in a laboratory situation where the students could preview the exact steps of the testing procedures before being turned loose on expensive and somewhat hazardous equipment. The videodisc player was borrowed from Classroom AV Services on permanent loan for the semester, was installed along with a large screen monitor on a wheeled cart which could be kept in a secure cabinet over night, and was readily available for daily use. Students who missed a lab session could easily review the procedures on an individual basis. The GTA found the system very user friendly, and students reported that following the visual examples made the lab go more quickly and more efficiently.

2. **CD-ROM.** By the time Phase II had begun, many changes were taking place. Interest in videodisc technology waned as glowing accounts of the attributes of the CD-ROM appeared in the journals. Small, durable, convenient, and capable of storing large amounts of data, the compact disk emerged as the latest attraction. At our university, every entering engineering freshman is now required to purchase a computer with a built- in CD-ROM unit. The College of Engineering Multimedia Lab now has the capability to record compact disks. The cost of mastering disks has dropped. Thus, the decision was made to focus on the development of CD-ROMs.

Within a brief period of time the HyperCard database was put onto CD-ROMs and distributed to the eight schools in the Coalition. Response to this effort was much more gratifying. Comments included statements such as, "This is an extremely good teaching tool. Today's students are visually oriented--they learn better from visual materials because they grew up watching Big Bird."

Still, there were additional problems ahead. The original proposal promised cross-platform delivery capability. Asymetrix released Multimedia ToolBook in 1991, the first multimedia authoring tool for Microsoft Windows. A beta version of an update was obtained, but the programmers had difficulty working with it. A new version of ToolBook (Multimedia ToolBook 3.0) had been promised but was long delayed. When finally the software did arrive there were problems in converting the data. Meanwhile, the electronic mail was flooded with requests for the CD-ROM in PC format, while others asked when the UNIX version would be available.

Simultaneously, new images were being donated. Whereas 700 full screen images with no compression would fit nicely on a CD-ROM, 850 images would not. Should the database be split in order to maintain the quality of the uncompressed images or should the images be reformatted using JPEG? Would JPEG work with ToolBook? What other means of compression were available? In the long run, would it be necessary to burn a new CD-ROM every time new resources were discovered? How would the UNIX population be served?

3. **Internet.** As consideration was being given to these and other questions, a new area of technology gained recognition. Although the network had been around for some twenty years, use of the Internet suddenly blossomed with amazing popularity in educational circles. Faculty began using electronic mail routinely and were soon branching out into the wilderness of Archie and Gopher. Classrooms and offices were being wired for Ethernet. John December, from Rensselaer Polytechnic Institute, writes that the World Wide Web, ". . . viewed using a Mosaic client is the fastest growing form of information retrieval on the Internet." (December, 1994, p. 33).

NCSA Mosaic will run on Macintosh, PC, and Unix computers.

Clearly the opportunities were now available for millions of users worldwide to access our engineering visual database.

Cleborne Maddux, a professor at the University of Nevada, states, "I am convinced that telecommunications in general and the Internet in particular are *potentially* the most significant educational tools that have become available in my professional lifetime." (Maddux, 1994, p. 37).

Maddux hastens to add, however, that, ". . . far too many educators seem concerned only with making the Internet accessible to students, and far too few seem concerned with making sure that teachers and students can and will use it in educationally appropriate ways." (Maddux, 1994, p. 38).

The question for us now becomes, how can technology best be used to disseminate the database in an educationally appropriate way? Will it be sufficient to make these visual materials available to engineering faculty and students through the Internet, or is there more that must be done? How can we meet the challenge of enhancing engineering education?

Other researchers in the SUCCEED coalition have already established a SUCCEED home page. It will be a relatively easy matter to develop the HyperText Markup Language (HTML) documents needed to transpose the HyperCard data into Mosaic format. Once the materials are on line there should be no further concerns with cross-platform incompatibility--but will the visuals be used?

We have found that faculty, for the most part, need to see the product as it applies to their specific situation. They need to "buy in" by identifying a particular need that can be reasonably met. They need classrooms that are designed for the use of multimedia with equipment already in place. And they need guidance in effective ways to incorporate visuals in their teaching. In the years ahead much work remains to be done to bring about real change in engineering education.

Conclusion

NSF is now supporting eight engineering coalitions, representing 65 schools in a determined effort to revitalize engineering education. About one-third of the nation's engineering schools are currently revamping their programs to make them more practical and responsive to industry. In the words of Carl Zorowski, director of the SUCCEED coalition, " . . . if we are to succeed, we need commitment, team effort, trust, vision, hard work, patience, understanding, and a sense of humor." (Zorowski, 1994).

Those seem to be excellent characteristics for any educator to emulate, whatever the task.

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Photography/Digital Imaging: Parallel & Paradoxical Histories

Mary Stieglitz Witte

Background

The history of photographic technologies may begin with the earliest human efforts to create accurate records of images in their environment. Numerous devices were employed over centuries of experimentation. The historical and theoretical underpinnings included linear / mathematical systems formulated to reconstruct the visual world optically. The camera obscura traces its roots at least to the eleventh century, and the camera lucida with lens and mirror was refined by the eighteenth century. This provided a basis for the search to capture and fix the camera's image during the eighteenth and nineteenth centuries. With the introduction of photography and photomechanical printing processes in the nineteenth century, the first age of machine pictures and reproductions emerged. The twentieth century advanced computer image processing systems, creating a digital imaging revolution. These rapidly developing technologies continue to blur distinctions between actual and represented reality, and alter both the technical and philosophical points of view regarding image making.

Repercussion

Photography at its genesis, and then digital imaging, both introduced radical new tools and provided significant transformation in the visual arts. They offered innovative artistic possibilities which in turn generated questions, concern, even backlash to 'machine-aided' art. Questions typically arise concerning the validity of art done via machine. Lovejoy (1992) notes that "The discovery of photography essentially questioned the functions of art. The theology of "pure" art, which grew once photography (as reproduction, as stills, as photomontage, as cinema) supplanted some of the social-use value of art, contained within its ideology such concepts as the divine genius of the painter and the sanctity of hand skills as the *only* means of making art."(p. 16).

The rapid proliferation of photography in the mid-to-late nineteenth century was accompanied by considerable repercussion. The painter Paul Delaroche is traditionally acknowledged as having pronounced 'From this day painting is dead'. The commentary that 'New arts destroy the old' is often attributed to Emerson. Baudelaire is also said to have offered his observation that 'Industry, by invading the territories of art, has become art's most mortal enemy'.

Photography and industry were not fatal to painting and art, but the visual arts were *immutably affected.* Just as photography proved to be a means of expression, creation, innovation, and communication, digital imaging now offers new modes of visualization, organization and production. Traditional photography will continue, but the influence of electronic technologies will be abiding. Quandaries persist as the nature of art and the artistic process is scrutinized in relation to computer technology. Rather than consider the cynical or adversarial aspects of the computer's influence on photography, it's more important to note the benefits gained. The electronic revolution offers alternatives that were previously not available.

Deconstruction & Alteration

Almost as soon as mathematical perspective was refined to 'reconstruct' the visual world, some artists set out to 'deconstruct' visual representation. For example, anamorphic distortion garbled, extruded, and hid an image, then used an optical system such as a mirrored cylinder to reclaim the view.

Soon after the introduction of photography, artists combined images, added color, recorded movement and made hand alterations. Image juxtaposition, the superimposition of multiple images, mutation, and the study of movement have many antecedents in the history of art. Cubism, Futurism and Surrealism all liberated viewers by placing the 'real' world in conjecture. Combined data sets and synthesized images have translated codes in different forms throughout the history of the visual arts.

Lovejoy (1992) noted the parallel paradigms of photography being to Modernism, as electronic media is to Postmodernism. (p. 16). As new tools were developed to reconstruct 'reality', some artists responded by generating ways to deconstruct that imagery. This opened the door for the phenomenon of the postmodern, and disintegrated barriers of traditional concepts of art. The confirmation of both photography and electronic imaging as influences and tools in the visual arts emerged.

Transformation

Photography has been the medium most associated with realism. William J. Mitchell (1992) observed that "After more than a century and a half of photographic production, we also have to contend with the powerful 'reality effect' that the photographic image has by now constructed for itself." (p. 26). Twentieth century visual technologies have further erased the distinction between the actual and the represented world. The role of representing the three-dimensional world has expanded with electronic tools. The development of three dimensional imaging technologies, virtual reality, and real time imaging further blurs distinctions and alters visualizations. Mitchell also noted that we may "...see the emergence of digital imaging as a welcome opportunity to expose the aporias in photography's construction of the visual world, to deconstruct the very idea of photographic objectivity and closure, and to resist what has become an increasingly sclerotic pictorial tradition." (p. 8). Images manipulated by the computer further subvert the 'realism' associated with photography and invite new quests in visualization.

Digital imaging encompasses a diverse array of techniques and applications, from the computer as an electronic replacement for traditional media, to the exploration of digital tools for their unique capabilities and their new ways of influencing perception and thought. Electronic imaging offers us the ability to generate and manipulate more images, by more means than ever before. We currently deal with the quandary of an era when artists celebrate the potential of digital image manipulation, and the press would prefer a code of ethics to regulate manipulation. High resolution graphics with recomposing and retouching capabilities raise the question of what is 'real'. Is photography any longer evidence of anything?

Thus digital imaging with its new conventions, forms, manipulations, and transformations, has jolted photography's 'reality reference'. While basically aware of the differences between objects and their photographic representations, traditional assumptions about the 'reality' of photographic images, combined with the manipulations possible with digital images, create a dilemma. A parallel is that both traditional photography and digital imaging re-present our visual world. Veracity of representation is a growing concern, with virtual reality an example of current directions to further confound the eye.

Photography 'compressed' the

three-dimensional world to a two-dimensional surface, with the visual world as the model. Now electronic imaging 'decompresses' or releases images to 3-D, 4-D, 5-D with dimensions and sensations beyond reality ... that have not previously existed and could take on new meanings.

Each new technology applied to art forms offers potential for new aesthetic constructs, both visual and conceptual. The current generation of digital / electronic imaging is marked by repercussion, transformation, mutation, proliferation and velocity.

Differentiation

The distinction between digital and analog representation is significant. Digitally encoded and computer processed images are clearly distinguished from that of their photographic predecessor. Critical factors are differing amounts of information, and differing characteristics of replication and manipulation in each format. Digital information is easy to manipulate, recombine, and transform ... it is infinitely malleable.

The amount of complexity can be exceptional in computer generated images, and the risks also enormous. So many versions can be created so rapidly, that the alternatives and speed are extraordinary. Multiple sequences of creation are common, and it is curious that few artists exhibit sequential works.

Many regard computer use as relinquishing 'high touch', yet the human factor is critically important. The machine plus the human mind is far more synergistic than machine alone. The tool alone is never the artist. The tool in teamwork with the artist serves the artistic process explicitly. The human/machine interaction is richly expressed in the creation of sophisticated hardware, software, applications and products. Human talent remains the most important resource. The gap between artist and technology is narrowing as artists meld intuitively the real with fabrication. This further obscures the distinction between the actual environment and the altered environment.

New technologies enable artists to look at things in new ways, push technique beyond the traditionally possible, and to go *beyond mere fascination with the tools to* personal, individual statements. We may then reach a level beyond works that merely display technique. A toolsmith alone is just an operator of the machine. The true collaboration of artist, hardware and software designers produces a win/win situation. A creation greater than the sum of the parts can result. Collaboration allows for multiple credits, varied perceptions, new questions and problems to solve. Significant opportunity exists for both interdisciplinary and intermedia alliance which may well influence the process, product and context of the new technology.

Hybridization is a common bond between traditional and new technologies. Many works begin with traditional photography or art media, and add computer manipulation to produce new combinations. Metaphors arise quickly. We now hear of the 'electronic darkroom', and software that offers dodging, burning, drawers, brushes, crayons, paper surfaces, sketchbooks, and all the traditional tools. A metamorphosis may result that produces works that never could have existed outside the computer. This may eventually necessitate a new vocabulary.

Replication

Much as photography influenced painting, digital imaging has further diminished the customary differentiation between unique originals and multiples. This challenges traditional control of replication, distribution, and concepts of 'value', and differs fundamentally from conventional, established rules of the art market. The issues of public versus private art, authorship, copyright and permanence will present perplexing questions for the market and any collectors bound to the old rules.

One response to the concerns is to recognize the significance of the artist's concept above the tool, material or process. The originality of the visual statement does not depend on the rarity of the image, the laborious handwork required, intricacy of process, or tradition of the tool. The objective of a print or 'hard copy' is traditional, yet digital media may not necessarily follow that model. Prints can be made, yet publication and dissemination can remain in the electronic mode. The forms can be uniquely interactive, collaborative, or network-based ... and not dependent on traditional hard copy meant for wall exhibition.

"Digital imagers give meaning and value to computational ready-mades by appropriation,transformation, reprocessing, and recombination; we have entered the age of electrobricollage." (Mitchell, 1992, p. 7). Artists approach new forms with diversity, spontaneity, a sense of discovery, exploitation of the technology, and elements of play. Opportunity is rich for artist/machine interaction and free exploration. New tools afford potential for new combinations of art and technology, and a fresh repertory of forms, methods, communications, and interpretations. Many artists attempt to demolish the confines which are intrinsic to the computer and explore the plastic and expressive potentials of digital imaging. Every tool offers particular limits as well as potentials to be considered. The immediacy of digital production is a factor which appeals to many artists.

Velocity

Nineteenth century draftsmen and painters saw photography as a very quick way to record the visual world. Currently, the speed of capture, manipulation, print production and transmission of electronic images reflects the increased velocity of twentieth century life. In both instances, the images became available to many more people. Before photography, only the wealthy could have their portrait painted. As the 19th century progressed, itinerant photographers offered portraits to ordinary people in diverse places. Now electronic images are transmitted instantaneously and globally. Both photography and electronic imaging offered a democratizing influence.

Conclusion

The near wizardry of digital technology is reminiscent of the magical quality attributed to photography in its early years. Some parallels have been briefly examined in this discussion. The paradoxes also present themselves for consideration. Each new technology brings with it a set of potentials and limitations. Each necessitates learning the technical aspects in order to freely explore the expressive and conceptual ideas. Each also has a countenance, an idiom, as well as a capacity for unique realizations.

The debates will likely escalate as digital imaging becomes a global representation, just as photography did in its first 160 years. Image form, meaning, use, and value will essentially change. Digital imaging offers potential for new constructs, both visual and conceptual ... and will permanently transform visual arts and extend our notion of art. Electronic imaging will necessitate new ways of perceiving, knowing and judging art. The digital revolution offers empowerment and opportunity, as well as new problems such as ethics and copyright.

The Survey

The **slide survey** constitutes the 'eye' of this IVLA presentation, and exemplifies some of these new visual paradigms. The images speak eloquently. The slides present a visual panopticon of selected historic and contemporary artists. The sample provides a rich repertory of diverse artists exhibiting new images and forms. Some artists demolish the limits inherent to their medium. Each medium and tool offers particular restrictions as well as capabilities for the artist. These visual selections represent a variety of concept and expression.

Artists differ greatly in what they *bring* to the computer. Some generate their visual forms on the computer alone, while others digitize their photographs and other visual material for a hybridized approach. Still others use the computer as an intermediary tool. One example is the use of digital tools to produce images for the construction of a final collage or composition. The artist then fabricates one-of-a-kind works with computer generated images. An interesting paradox exists in this use of tools engineered for reproduction to create unique works.

Many of these artists have had considerable influence in the use of computers as a tool/medium in the visual arts.

There continues to develop a syntax of digital imaging, resulting in new pictorial forms and altered views of our world.

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What is the Relationship Between Artistic Performance and Visual Proficiency?

Barbara W. Fredette

OVERVIEW OF STUDY

The purpose of this current study is to attempt to find commonalities between visual proficiency and artistic performance. In order to assess visual proficiency a test of spatial ability as generic visual skills was developed and pilot tested with intermediate level elementary school students. Their performance on the test has been recorded and will be examined in relation to two measures of their performance in art. One of these is their art teacher's assessment of their ability (anecdotal and report card) and the other will be through the administration of Clark's Drawing Abilities Test. Results will be examined to determine if there is a relationship between the assessment of specific visual skills and that of the visual abilities practiced through artistic performance. In addition, a goal of this effort is to find operationally valid support for the transferability of artistic performance to other domains and, eventually, to vocational goals. The report which follows is of the progress of this endeavor.

EXAMINATION OF TERMS

In order to communicate it is important to agree on definitions especially if they are honorific or stipulative. For the purposes of this study visual proficiency refers to spatial abilities which in turn are subsumed as exemplary of spatial cognition or intelligence. Currently any reference to spatial intelligence reminds the reader of Gardner's Theory of Multiple Intelligences. Gardner (1983) decided not to use the sensory mode of vision as a prefix to his identification of spatial intelligence. However he uses visual-spatial examples to demonstrate this intelligence. Although artistic ability may represent an example of the use of spatial intelligence, spatial intelligence is more comprehensive, more inclusive of a variety of visual abilities or skills. The concern of this study is to examine the overlap, if any exists, between visual proficiency assessed as visual skills and artistic performance assessed through the production of art, or more specifically drawing.

PRECEDENT FOR ASSESSING SPATIAL ABILITIES

There is a history to the measurement of spatial abilities as the mental manipulation of spatial relations. As early as the 1920's and through the 1930's factor analytic studies found a mathematically distinct spatial factor (McGee 1979). The first clear evidence for the existence of spatial "abilities" came in 1947 when Humphreys analyzed the results of thousands of tests given to military personnel (McGee 1979).

Two spatial factors emerged from this study. They were spatial visualization and spatial relations. Visualization was described as requiring an ability to imagine the rotation of depicted objects, the folding or unfolding of flat patterns, the relative changes of position of objects in space or the motion of machinery. Spatial relations was described as involving comprehension of the arrangement of elements within a visual stimulus pattern (McGee, 1979, p. 17). Several of the studies cited by McGee were conducted with school age children as early as second grade. McGee examined historical as well as recent (70's) studies and came to the conclusion that there was "strong and consistent support" for the existence of at least two distinct spatial abilities (p.3).

The two abilities McGee (1979) identified are spatial visualization and spatial orientation. His descriptions of the two abilities are useful toward developing an understanding of the mental activity required by each. He writes that:

> **Spatial visualization** is an ability to mentally manipulate, rotate, twist or invert pictorially presented visual stimuli. .. The underlying ability seems to involve a process of recognition, retention, and recall of a configuration in which there is movement among the internal parts of the configuration, or of an object manipulated in three-dimensional space, or the folding or unfolding of flat patterns (McGee, 1979, p. 3).

If this is considered from the standpoint of a perceiver and the phenomena which is being perceived then **spatial visualization** represents mental manipulation of what is being perceived. The second type, **spatial orientation,** requires (mental) movement of the perceiver; the ability to determine spatial orientation with respect to one's body. McGee tells us that:

> **Spatial orientation** involves the comprehension of the arrangement of elements within a visual stimulus pattern, the aptitude for remaining unconfused by the changing orientations in which a configuration may be presented, and the ability to determine spatial relations in which the body orientation of the observer is an essential part of the problem (McGee, 1979; p. 4).

Both spatial visualization and spatial orientation should be considered in a comprehensive assessment of visual abilities. It may be that spatial orientation can best be assessed by means of the representational drawing tasks identified by Clark's Drawing

Abilities Test (Clark, 1989) or Project Spectrum's Assigned Drawings (Gardner, 1993). The assessment of spatial visualization may be accomplished through use of the Visual Abilities Test which is being developed.

The examination of visual skills as spatial intelligence factors related to art production has occurred in at least one higher education setting. McWhinnie (1994) reported on a ten year study of the spatial intelligence factors of a group of 130 art students at the Maryland Institute, College of Art in Baltimore, Maryland. His reported findings for the early years of the study were that spatial test scores (if the highest and lowest were considered) were as predictable of student success in foundational art courses as teacher evaluations. Further, it was found that among the students tested there were two major modes of spatial intelligence which were 1). Analytical and 2) Holistic. The ones determined to be analytical had the highest scores on the 7 spatial tasks while the Holistic scored the lowest. From these results it appears that the spatial abilities sampled in the test tasks may use a high level of thinking process. This calls for further investigation.

McWhinnie also reported that Johns Hopkins Center for Gifted and Talented has adapted a spatial dimensionality test. He reported on a 1990 experimental version which included items from several sources. Embedded figures, card rotations, surface development and copying test items were from ETS, rotations test items were from Elliot-Price, perspective items were from Stumpf and paper folding items were from SOI. A vocabulary test (ETS) was included for psychometric purposes. The samples shown by McWhinnie indicated that these tests consisted of black and white line drawing "test" type items. It appears that the dimension of spatial abilities as visual proficiency is being given consideration in the identification of the gifted and talented. To what extent a value for visual abilities may surface in the current national assessment effort may warrant further scrutiny.

The major purpose of the study being reported here is not to identify or to discriminate among individual students but to determine what overlap, if any, exists between two different assessment approaches to spatial abilities. In the development of his drawing abilities test, which was designed to identify artistically gifted students; Clark (1989) compared the results of his test with those of the CEFT (Children's Embedded Figures Test). Although no significant correlation was found there was an overlap. Embedded figures is a cognitive style test of visual ability but it measures this ability in only one of the number of visual abilities which may be assessed. The assessment instrument being developed examines a range of visual abilities.

THE ASSESSMENT OF CHILDREN'S SPATIAL ABILITIES

In their writings and research, spatial cognitivists Bailystok & Olson (1983) have established that art experiences contribute profoundly to the acquired functional capabilities within the spatial intelligence realm. Contemporary authors such as Eisner (1985) Perkins (1994) and Gardner (1991) have emphasized the cognitive aspects of visual art by declaring that it as an important and valid way of knowing. Furthermore, these authors suggest that artistic abilities may underlie performance in other content areas such as science and math.

A problem with establishing these connections lies in the fact that artistic performance exemplifying facility in this way of knowing tends to be assessed by essentially aesthetic rather than cognitive criteria. The transferability or generalizability of artistic performance to other contents needs to be demonstrated. An important outgrowth of such a demonstration would be to reinforce the notion that art learning should be accessible to **all** students. The connections between the visual abilities revealed and practiced through artistic performance and those used in domains other than art should be investigated.

Gardner (1983) reminds us that the concrete operations of Piaget's theory marks the turning point in mental development which means that the child is now able to actively manipulate objects and images in the spatial realm. He is capable of reversible mental operations so that he can identify how objects would look to people approaching them from different viewpoints and he can indicate how a room would look to someone seated in different parts of the room or "how an object would look if rotated in space" this spatial intelligence is "still restricted to concrete situations and events" (p.179). If the spatial intelligence referred to by Gardner is not a general factor but is instead comprised of two or more types of abilities such as visual orientation and visual manipulation than assessment of visual ability should be designed to accommodate the variety.

Another theory which contributes support to this assessment effort is the notion of fluid and crystallized abilities which may be used in combination in solving the spatial intelligence tasks (Lohman, 1990). Fluid abilities are brought into use when engaged in novel problem solving tasks such as spatial tasks which require the child to reason with novel figure or symbolic stimuli. Simultaneous processing refers to the mental ability of the child to integrate input all at once to solve a problem correctly. Simultaneous processing frequently involves spatial, analogic or organizational abilities. Spatial or figural reasoning tasks continue to play a prominent role as measures of general cognitive abilities such as those considered to be fluid measures factors. When dealing with young students we are focused on fluid intelligence and its assessment.

DEVELOPMENT, USE AND PRELIMINARY RESULTS OF THE INSTRUMENT

In light of today's educational reforms it may appear that the development of a test is a retro effort. Why would anyone be interested in developing a test of skills when educational assessment in general, and at all levels, is becoming process/ portfolio oriented? The justification for this effort is tied to the recognition that portfolio reviewers are engaged in the act of interpretation. Interpretation in the area of spatial cognition may be assisted through reiterative or overlapping documentation.

The development of this assessment tool came about as an outgrowth of two arenas of professional interest. In a graduate course in Visual Thinking visual skills are a frequent topic of discussion. McKim's (1980) examination of the active operations of visual thinking is illustrated by a variety of examples from psychological tests. These examples are labeled in ways which imply categorical variations of visual thinking skills.

In addition to McKim's analysis of test items students are given the opportunity to examine two sets of VISUAL THINKING CARDS developed by Dale Seymour (1983). These activity cards were developed to provide students, from grades 3 through 12, with opportunities to practice the spatial perception skills represented by them. Seymour categorizes the cards by what he calls "concepts". Seymour's cards are very similar to the tasks found in psychological tests of spatial ability except that they are colored which appears to make them more appealing to students. Both the McKim and the Seymour materials have been explored by students as part of an inquiry process directed to the question "where do you practice these skills in real life situations". Besides the identification of common perceptual events, the areas of art as well as math were frequently identified in response to this question. Professional curiosity about the relationship between visual proficiency in spatial abilities and artistic performance followed.

The second arena of professional interest which led to this present effort is that of the identification of visually gifted children. The evolution of this continuing effort has been reported elsewhere (see Fredette 1994, Fredette, 1993). It was noted (Fredette, 1994) that classroom teachers, without art training, find it difficult to assess the cognitive or intellectual efforts represented in children's drawings. Furthermore they tend not to see artistic effort exemplified by drawing ability as more than drawing well. They do not see it as evidence of high level intellectual ability.

Children's drawings are a window on the mind, not a window on the world, but adults, outside of art teachers and enlightened parents, find it very difficult to assess the thinking exemplified in children's drawings. It may be due to their level of aesthetic development (see Michael Parsons, 1991) or to their level of visual literacy, but the results are detrimental to the identification of high levels of thinking that can be evident in the child's free drawings. On the other hand, general IQ tests include visual skill items--there is a precedent for their acceptance as evidence of cognitive ability. If we can document a positive relationship between the two it may serve to change the attitudes of non-art oriented persons to the cognitive abilities exemplified in children's drawing.

In order to look more closely at what is meant by visual ability, a test of generic visual skills is being developed with the assistance of a doctoral student, Eunjoe Lee Chae. The first version of the assessment instrument was given to a small group of intermediate level students who volunteered to take it in their free time. A revised version was developed and it has been pilot tested with students representing grade levels four and five. At this time their performance on the test has been examined in relation to their art teacher's assessment of their ability (anecdotal and report card).

A second assessment, which is not as yet completed, will be through the use of Clark's test of Artistic Giftedness. Much work remains to be done. A second revision of the visual proficiency assessment is called for. The nascent preliminary results which are available appear to justify the identification of specific visual skills exhibited in and practiced by artistic performance. The identification of these skills may, in turn, lend support to the transferability of artistic performance to other domains and, eventually, to vocational goals.

The experimental version of the test which has been developed consists of 5 pages with 4 cells or tasks on each page. The tasks are revisions of Seymour's VISUAL THINKING activities. Early in 1994 Dale Seymour was contacted by telephone. He was asked if any research had been done using the Thinking Cards. The response was no, but that he would be interested in any study which might develop. The specific tasks were selected to exemplify a variety of visual spatial abilities. (See Figure 1 at the end of this article for a list of the visual abilities to be assessed). The selected tasks also included attention to spatial orientation as well as spatial visualization (see McGee, 1979). Other considerations in the selection were the interests of intermediate level children such as codes and mazes. Note: examples of the tasks which represent each of these operational descriptions can be found in the experimental version of the visual abilities test which has been designed. However due to the problem of copyright the specific examples cannot be shown here as illustrations.

The small (6) group of fifth grade children who 'tried out' the test were quite enthusiastic about it. A few minor changes to facilitate group administration of the test were made before it was given to a combined fourth and fifth grade class. Due to scheduling problems, this test administration was a very recent event. Twenty-four students took the test. Their scores were analyzed in relation to a four point index of talent derived from the art teachers anecdotal report. Boxplots were made of the data. A more robust comparison will be made when Report Card data is available as well as the results of the Clark Test of Drawing Ability. In the meantime an item analysis revealed that no items had all correct responses and no items were missed by all 24 students. Further analysis in terms of type of visual ability the task samples is underway.

In summary it should be noted that the "test" being developed is not intended as a stand alone assessment of visual abilities or proficiency. It is a means of providing a single focused view which must be considered in relation to other assessments of an individual student. Some dimensions are lacking in the current test which we will put into place if another version is warranted. A metacognitive element may be included in the form of a question which asks the student to reflect upon the test they have just taken and describe their opinion of the kind of mental efforts the tasks required.

Mrs. LeeChae, the doctoral student who produced the experimental test and the necessary copies from a computer file had to overcome the problems inherent in the production, printing and copying of color graphic files. Her student allowance of computer file space was used up rather quickly. The extent to which full color is necessary as more than a motivator will need to be considered. But before that comes into consideration a more comprehensive answer to the initiating question; What is the relationship of artistic ability to visual proficiency; must be found. It may be true in this, as in many searches, that the road traveled is the major result.

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VISUAL ABILITIES

Ability to imagine:
- the rotation of depicted objects
- the folding or unfolding of flat patterns the relative changes of position of objects in space

Pattern comprehension; the ability to match the edges of figures with the corresponding elements in other figures

Ability to locate simple shapes within complex shapes

Ability to match similar shapes regardless of size or spatial orientation.

Ability to recognize shape in spite of shared boundaries

Spatial visualization:
- the ability to visualize the resultant pattern when folded and cut

Ability to manipulate 3D objects in (mental) space

Ability to locate points and estimate directions

Ability to imagine movement through a complex pattern (maze)

Ability to estimate relative size in spite of surrounding elements

Ability to visualize a configuration in which there is movement in the internal parts of it

Ability to manipulate or transform the image of spatial patterns into other arrangements

Ability to discount the effect of context (illusion)

Figure 1. Visual abilities assessed through test tasks.

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Timeless Images: Past and Present

R. Neal Shambaugh

Timeless Images:

Past & Present

Visuals capture the wonders of the world and document our full range of understandings of this world. Consider the following three examples. In the middle ages pictures were invaluable tools as memory maps of important information before book making became widespread. Ramon Lull's 1515 depiction of the whole range of human knowledge on a tree, provides an example of the practice, that can be traced back to the Greeks, of placing a word or an idea on an image (Yates, 1966). Leonardo da Vinci's notebooks (the *Madrid Codices*) contain some of the richest and most diverse examples of visuals that document not only the realities of his time, but also the representations and models of what he believed might be. However, the world required about 200 years to adequately appreciate and understand these meaning-rich representations (Reti, 1974). The thought experiments of Heisenberg and Einstein, a third visual example, used mental visualization examples to demonstrate new concepts, which transformed our views on Newtonian mechanics (Zukav, 1979).

Timeless Images

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Medieval Maps

Design

Mental Models

The images of today are no less timeless, as this paper hopes to persuade. However, the images of students' personal memory maps, designs, and models go largely unused and unacknowledged in the classroom. The purpose of this paper is to examine ways that teachers and students can leverage the power and potential of visuals to encode information and experiences as "personalized meanings;" in essence, help people to create their own timeless images as ways to understand the world.

The full range of ways that we have developed over the years to represent the world can be referred to as world knowledge. But in school, through lectures and textbooks, learners encounter only a small slice of world knowledge. This school knowledge, consisting of linear "bits" of information and structured for efficient delivery, eliminates many of the vital connections that human inquiry have built up into world knowledge over time (Eisenburg & Dreyfus, 1991). These links and interconnections contain much of the richness of our documented world -- interrelationships of facts, understandings from multiple contexts, useful ideas from other fields, and the heritage of the knowledge-building process. Without these connections, how are learners to construct frameworks of significant, useful, and meaningful information? Ultimately, students unknowingly face impoverished information and provide weak and temporary structures into which to organize this information.

Scope of Paper

Clark (1989) has recommended that researchers spend more time conceptualizing the research necessary to test their positions. This paper is the second of two that lay out the foundations for conducting research to test the assertion that visual constructions can be used to help learners construct highly personalized meanings to information. This paper will summarize from the initial paper the *cognitive potentials* of visual constructions and examples of visual constructions that might be useful to teachers and students. This paper will suggest at approximate grade levels *teacher and student strategies* to implement these visual constructions. Identifying teacher and student strategies with particular visual construction types suggests relevant learning settings in which to formulate research goals, which might be studied using an appropriate mix of quantitative and qualitative approaches.

Cognitive Potentials

Visual constructions represent any visual scheme to organize information. Such constructions can range from the common practice of highlighting information in an article or textbook to the use of concept maps to visually represent one's understanding of the relationships between information.

An earlier paper (Shambaugh, February 1994) surveyed visual note taking methods and outlined three categories of cognitive potentials. (See Table 1 for a summary). Visuals have the potential, first of all, to act as *personal organizers* of personalized meanings to information by providing alternate representations of knowledge and by structuring information and conceptual relationships of knowledge in highly unique and personal ways. The representation form is a unique, personalized knowledge structure which may be faulty at first but can evolve to become, over time, more compact and efficient with an overall higher degree of personal meaning than before. By their compact nature visuals are rich sources of information and possess features, such as symbolic attributes, that enrich the visual or make it more accurate. Visuals that are incorporated into a personalized notetaking system help to organize conceptual relationships based on their connecting and organizing features, and also help to provide closure to ideas and concepts, which would be difficult to achieve with verbal information alone (Barwise & Etchemendy, 1991). Visuals used for notetaking may also improve concept learning in both concept assimilation, and with evolved visual notetaking systems, may assist in concept formation (Ausubel, 1966). Classrooms generally impart "ready-made" concepts to students, but visuals used in note taking may improve understanding of these ready-made concepts by allowing learners to construct unique representations of their understanding.

A second category of cognitive potentials treats visual constructions as *efficient processors* of information. Larkin and Simon (1987) cite the major value of visuals, is not that they create new representations, but that they consume less computational energy. Visuals, or diagrammatic representations as Larkin and Simon refer to them, preserve explicitly the relationships of the visual information. The information in diagrams is "indexed by location in a plane," while written information in the form of sentence representation, is "information indexed by position in a list." These sequential representations require greater amounts of cognitive processing power than for the processing of diagrams. Visuals also possess the capacity to reduce the problem solving time by limiting the choices a student has to make.

Visuals also improve overall cognitive processing by serving as primers of information, which is based on the fundamental connotations that some visuals have. For example, any symbol that represents a category can stimulate recall to members of the category (Miller & Burton, 1994). Priming is useful in the short-term to a student desiring recall of information for quizzes or tests. In the long run, visual primers lay the basis for efficient and powerful recall of concepts, knowledge, and insights over a life span.

Visual constructions also provide deeper processing through active learning, attention, and multiple modes of communication. If incorporated into instructional strategies and learning activities, visuals can enhance the processes of active learning by improving the engagement of learners to tasks. Another learning issue is attention. Although not sufficient for learning by itself, attention may be improved through the use of any method that promotes activation of encoded knowledge structures, which are enhanced by the symbolic attributes of visual constructions. Finally, since multiple channels are

Table 1: Cognitive Potentials of Visual Constructions

Personal Organizers	Efficient Processors	Personalized Understandings
• Alternate representation of knowledge • Structure information • Conceptual relationships	• Efficient use of computational energy • Active learning • Attention • Multiple communication modes	• Self-construction of knowledge representation • Improve teacher-student relationships • Satisfy cognitive needs

promoted through the use of visual constructions to supplement visual and verbal presentations of instruction, a deeper level of processing is activated by the learner.

A third category of cognitive potentials of visual constructions is that they provide *personalized sources of understanding*, particularly when they are used by learners to generate their own representations of knowledge. Self-constructed frameworks are more meaningful than external representations, although not necessarily more accurate in the early development of understanding. The use of visuals in the classroom may also result in improved understandings between learner and teacher by providing both with visual evaluation tools, such as when student-drawn concept maps illustrate difficulties with certain concepts. Visuals can also be used by teachers to gain insight into a learner's learning style, higher level thinking, and self-image. Visual constructions, as a tool or strategy, also help to satisfy a learner's cognitive needs or motivations to observe and know the environment. The use of visuals could ultimately become part of a personalized learning process, a metalearning strategy that helps learners to monitor their own learning and to reflect and make changes in how they learn.

Visual Construction Types

Table 2 summarizes the essential features, benefits, and drawbacks to visual constructions used in notetaking strategies. These techniques or systems have been matched to appropriate grade levels in Table 3.

These constructions were grouped into four categories or families. *Page organization* types of visual notetaking organize a page visually and provide a structural framework to help students organize their notes. The second category identified are *visualization* methods, ranging from mental images to word pictures, and interactive study guides. *Concept diagrams* form a third family, consisting of concept circles, concept maps, and knowledge vee diagrams. Concept diagrams share a common feature in that they represent conceptual structures and relationships between concepts. Knowledge vee diagrams are visual tools that also help students to discover what knowledge is and how it is constructed. Finally, a fourth grouping of visuals include *notetaking teaching processes*, the most simple being graphic organizers.

Teacher & Student Strategies

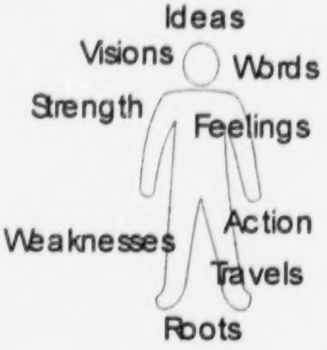
Certain types of visual constructions may be more useful to teachers and students in different settings and at different grade levels: K-5, middle school, and high school. These methods can be categorized as Teacher Strategies and Student Strategies. Table 3 lists teacher strategies that feature examples of visual construction strategies or notetaking systems. This rationale also allows the reader to investigate the details of the method and to adapt it to one's own needs or learner goals. Student strategies include suggestions that are linked to specific teacher strategies as they are contingent to a large degree on what the teacher does, but can lead to self-directed decisions outside of formal schooling. Next, are three examples of documented teacher strategies to demonstrate the application of some of the cognitive potentials described earlier.

K-5: Draw & Tell Stories

Richard Thompson's draw-and-tell stories involve the teacher drawing a picture as he or she is telling a story. Children participate by predicting and anticipating the action. Once teachers get used to the process they can come up with stories of their own. The process can be varied in several ways, but encouraging students to retell the story in partners, small groups, in class, to other classes, helps students to create their own story based on their knowledge of the structure and pattern of the story as well as from their memory of the story's details. Children acknowledge understanding of themselves as well as the ideas of others and the process stimulates visualization, active participation, and provides a "vehicle for explaining other language experiences" (Thompson, 1988, p.8). Thompson says that one objective in these stories is that stories are fun and magical and that children have ideas that are valued.

Middle School: Word Pictures as Thought Structures

Visuals can be used to represent four major types of thought structures: descriptive, narrative, expository, and persuasive (Stein, 1987). For example, a stick person can describe the attributes of people by labeling people qualities to body sections. This emphasizes the total person rather than just what a person did and enlarges person's life.



Word Picture

Table 3: Teacher and Student Strategies

K-5

Teacher Strategies	Student Strategies
Provide visual examples to demonstrate objects, people, places, ideas.	Search and share visual examples
Use mind pictures (Fredericks, 1986) in reading activities	Practice visualization exercises at home
Picture stories (Thompson, 1988)	Listening, speaking, reading, group participation, re-telling of story; I-Draw-You-Tell; make up story.
Outlining (later grades) instruction and appropriate topics and learning activities.	Later grades: Practice in recording key points for assigned papers.

Table 3: Teacher and Student Strategies (continued)

Middle School

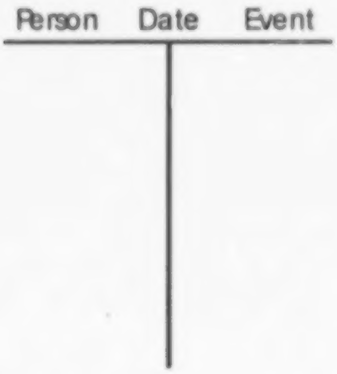
Teacher Strategies	Student Strategies
Encourage and model outlining as a study strategy; couple with other visual strategies when feasible	Use to make decisions on important ideas; construct personal outlining methods
Present page organization (Pauk, 1962), T-Line and Note-Page (Stein, 1987) and provide guided instruction with relevant examples; encourage the use of Reflection and Analysis or Synthesis sections within note taking page.	Experiment with page organization methods and personalize to fit one's needs; practice using Reflection and Analysis or Synthesis sections.
Word pictures as thought structures (Stein, 1987) to develop critical analysis of concepts and ideas	Keep portfolio of word pictures, either borrowed or self-constructed, and use with other coursework.
Introduce and experiment with the use of concept circles (Wandersee, 1987); use color when possible. Use groups and shared group activity to develop practice with techniques of concept mapping.	Personalize and experiment; share in groups.
Directed Note-taking Activity (Spires & Stone, 1989). Requires significant time to introduce and practice, include meaningful examples.	Personally consider value of system and modify for one's use, if necessary; teach to other students.
Incorporate graphic organizers (Sakta, 1992) before, during, and after lectures, activities, or presentations	Use in self-study, presentations.
Content visuals (wide range unique to subject content), such as weather maps, biogeochemical cycles, Feynman diagrams, physics diagrams, Periodic Table, atomic models, schematics, blueprints, etc.	Collect content visual types and become familiar with how they work and what they can tell you if used correctly.

Table 3: Teacher and Student Strategies (continued)

High School

Teacher Strategies	Student Strategies
Encourage and review page organization (Pauk, 1962) methods; provide opportunities for use	Keep journals, working logs and use personalized methods.
Interactive study guides (Cyrs & Smith, 1991) to ensure coverage of discipline but also to provide resources to develop problem solving skills and satisfy cognitive needs. Provide relevant assessment which matches the approach of the guides.	Reflect in journals, logs, feedback to instructor, on how you are performing on class requirements and suggest re-direction.
Text Structures (Smith & Tompkins, 1988) to highlight the various ways to organize verbal and written information	Reflect on methods you use to establish meaning to what you hear in class and read from books, papers, and other sources.
Introduce concept maps (Novak & Gowin, 1984) into content-specific courses and spend adequate time with its introduction and practice; use to identify conceptual misunderstandings.	Practice
Use Knowledge Vee diagrams (Novak & Gowin, 1984) when additional concept mapping is required or desired.	Practice
Continue to use graphic organizers (Sakta, 1992) but continue to move students away from detail	Allow organizers to cue your note taking and understanding.
NOTES system (Stahl et al, 1991)	Practice
Guided imagery (Unumb, 1994) for problem solving and creative situations when writer's block is present; requires careful scripting.	Willingness to engage in this activity is necessary. Consider using out of class for similar problem solving and creative situations.

When narrative thought, or chronological verbal set of information is emphasized, a visual such as a T-line can be useful to visualize and connect a person (left side of T-bar) to an event (right side)with a corresponding date (vertical bar of T). Expository or explaining thought can be depicted through the use of a triangle where each side can be labeled with cause, effect, and conclusions with corresponding relationships listed off each face of the triangle. A fourth type of thought, persuasion, can be visually depicted through the use of a scale which visually weighs the pros and cons of a particular view or position.



T-Line

These and many other visual constructions can be used to help learners retrieve and categorize information. Furthermore, the use of these thought structures help students with the writing process by generating questions and listing important ideas.

High School: Interactive Study Guides

Discipline-specific courses, which involve presentation of concepts, relationships of people to concepts, and the sequence of ideas and events can benefit from the use of structured interactive study guides, a format designed to emphasize note-taking rather than note-copying. The challenge is to balance the providing of information with encouraging involvement.

The interactive study guide features key notes, phrases, and visuals in numbered segments. This allows students to concentrate on what's being said or demonstrated, rather than on what's being written. However, not all of the critical information is provided, which requires students to attend to what is being said or presented. A space for notes is included. Another key feature is the use of word pictures, which consists of line drawings, shapes, clip art, symbols, arrows, to provide graphic representations of ideas, concepts, or data.

Interactive study guides can be used in telecourses and large classes where direct participation is difficult or impossible. For complex aspects of some courses the time needed to assemble the guides are outweighed by the learner benefits of accuracy, completeness, interactivity, and visual connections to the material (Cyrs & Smith, 1991).

Research Goals

In my initial conceptual organizing paper on the cognitive potential of visual constructions, I cited a comment from Elliot Eisner that philosophically serves to begin this research program: "What can we do that does justice to develop human intellectual capacities?" (Eisner, 1983, p. 5).

The following are three broad research goals to consider in order to establish some basis for the cognitive potentials of visual constructions as identified above.

- How do personalized meanings via visual constructions create understanding? (and what is meant by understanding?)
- What are the effects of possible cognitive-motivational variable links when visual constructions are used by teachers and students?
- Which teacher and student strategies using visual constructions contribute to development of self-directed learning characteristics?

Timeless Images:

Future

The purpose of visual constructions is to help learners construct their own representations, or what have been referred to in this paper as "personalized meanings" to information presented to them and discovered by them in school. These personalized images, not only set the stage for more meaningful learning in school, but they can become integral performers over a lifetime, so that as learners learn they essentially create their own *timeless images*.

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